DOT/FAA/AR-98/37

Office of Aviation Research
Washington, D.C. 20591

Boundary Correction Factors for Elliptic Surface Cracks Emanating From Countersunk Rivet Holes Under Tension, Bending, and Wedge Loading Conditions

March 1999

Final Report

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Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
DOT/FAA/AR-98/37		

4. Title and Subtitle	5. Report Date
BOUNDARY CORRECTION FACTORS FOR ELLIPTIC SURFACE CRACKS EMANATING FROM COUNERSUNK RIVET HOLES UNDER TENSION, BENDING, AND WEDGE LOADING CONDITIONS	March 1999
	6. Performing Organization Code
7. Author(s)	8. Performing Organization Report No.
Anisur Rahman*, John Bakuckas, Jr.** , Catherine Bigelow**, and Paul Tan**	
9. Performing Organization Name and Address	10. Work Unit No. (TRAIS)
*FMRC, Materials Engineering Drexel University Philadelphia, PA 19104 **Federal Aviation Administration William J. Hughes Technical Center Airport and Aircraft Safety Research and Development Division Airframe Structures Section Atlantic City International Airport, NJ 08405	11. Contract or Grant No.
12. Sponsoring Agency Name and Address	13. Type of Report and Period Covered
U.S. Department of Transportation Federal Aviation Administration Office of Aviation Research Washington, DC 20591	Final Report
	14. Sponsoring Agency Code
	AAR-431

15. Supplementary Notes

16. Abstract

To predict crack growth and residual strengths of riveted joints subjected to widespread fatigue damage (WFD), accurate stress and fracture analyses of corner and surface cracks at a rivet hole are needed. The results presented in this report focus on the calculation of stress-intensity factor (SIF) solutions for cracks at countersunk rivet holes for tension, bending, and wedge load conditions. A wide range of configuration parameters were varied including the crack size, crack shape, and crack location as well as the length of the straight-shank hole. A finite element based global-intermediate-local (GIL) hierarchical approach was used in this study. The results are expressed as boundary correction factors (BCF), which is a nondimensional representation of the SIF. The boundary correction factors were determined along the crack front in terms of the physical angle, which was measured from the inner surface of the plate to a point on the hole boundary or the outer surface of the plate. In general, the values of boundary correction factors increased as one move along the crack front from the inner surface of the plate towards the hole boundary or the outer surface. The values of the boundary correction factor were highest for the crack fronts closest to the hole boundary. The trends in the solutions were the same for the three loading conditions

17. Key Words	18. Distribution Statement
Aging aircraft, Wide spread fatigue damage, WFD, Riveted lap-splice joints, Corner cracks, Global-intermediate-local approach, Stress-intensity factors, Finite element analysis, Breakthrough cracks	This document is available to the public through the National Technical Information Service (NTIS) Springfield, Virginia 22161.

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	79	

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EXECUTIVE SUMMARY

To predict crack growth and residual strengths of riveted joints subjected to widespread fatigue damage (WFD), accurate stress and fracture analyses of corner and surface cracks at a rivet hole are needed. The results presented in this report focus on the calculation of stress-intensity factor (SIF) solutions for cracks at countersunk rivet holes for tension, bending, and wedge load conditions. A wide range of configuration parameters were varied including the crack size, crack shape, and crack location as well as the length of the straight-shank hole. A finite element based global-intermediate-local (GIL) hierarchical approach was used in this study. The results are expressed as boundary correction factors (BCF), which is a nondimensional representation of the SIF. The boundary correction factors were determined along the crack front in terms of the physical angle, which was measured from the inner surface of the plate to a point on the hole boundary or the outer surface of the plate. In general, the values of boundary correction factors increased as one move along the crack front from the inner surface of the plate towards the hole boundary or the outer surface. The values of the boundary correction factor were highest for the crack fronts closest to the hole boundary. The trends in the solutions were the same for the three loading conditions

INTRODUCTION

Ongoing aging aircraft research activities are aimed at developing and implementing advanced fatigue and fracture mechanics concepts into the damage tolerance analysis methodology for the aging, current, and next generation fleets. These activities include methods to predict the onset of widespread fatigue damage (WFD). The Industry Committee on Widespread Fatigue Damage was formed to implement a long-term cooperative program to develop a common understanding of the WFD phenomena and to improve the identification of likely locations and assessment methodologies. One of the objectives of the Federal Aviation Administration's National Aging Aircraft Research Program is to develop the methodology to predict crack initiation, crack growth rates, and residual strengths of aircraft structures subjected to WFD. Among the fourteen possible locations susceptible to WFD identified by Industry Committee on WFD, the riveted lap splice joint has been identified as one of the critical locations on an aircraft. Widespread fatigue damage at riveted lap splice joints is usually in the form of multiple cracks emanating from the stress concentrations in the rivet holes. To reliably predict crack growth rates and fracture strengths of riveted joints subjected to WFD, accurate stress-intensity factor (SIF) solutions of corner and surface cracks at a rivet hole are needed.

Exact closed-form SIF solutions for cracks in three-dimensional solids are often lacking for complex configurations such as countersunk rivet holes; therefore, approximate solutions must be used. Over the past two decades, considerable effort has been placed on developing computationally efficient methods which provide highly accurate SIF solutions for cracks in three-dimensional bodies. These methods include the conventional finite element method (FEM) [1-4], the finite element alternating method (FEAM) [5-7], the boundary element method (BEM) [8-9], and the three-dimensional weight function method (WFM) [10-11]. With advances in pre and post processors, computer hardware and improvements in equation solvers, time savings are being realized in both geometry development and analysis of complex models. With computational tools in place, much needed SIF solutions required for damage tolerance assessments of cracked rivet holes can be obtained.

A recent experimental study [12] provides extensive experimental data on the crack front shape and fatigue growth of cracks from rivet holes in fuselage lap joint regions. Fatigue damage in an actual fuselage lap joint removed from a full-scale test article was characterized. An extensive database was established cataloging the damage state of the fuselage lap region including crack initiation, crack growth rates, crack size, crack location, and fracture morphology. Non visual cracking from rivet holes in the inner skin, outer skin, and tear straps was found during fractographic examinations. In the outer skin, cracking typically initiated from the rivet hole at the faying surface between the inner and outer skins due to fretting. Marker band analysis showed that the cracks typically grew beneath the surface with elliptical fronts, remaining hidden for a portion of their growth. The tunneling cracks broke through to the outer surface after growing to lengths of two to three times the skin thickness. To complement such experimental studies, SIF solutions would be useful in interpreting results as well as conducting damage tolerance assessments. Some work has been done to generate SIF solutions for cracks in countersunk rivet holes [4,7]. However, many gaps exist in available SIF solutions and further work is required, particularly for breakthrough crack configurations and solutions under bending and wedge loading.

The objective of this work was to develop SIF solutions for cracks at countersunk rivet holes to expand on the currently available solution database. Configurations representing typical countersunk holes in aircraft structural joints were analyzed under tension, bending, and wedge loading conditions. The crack size, crack shape, and crack location were varied to represent typical experimental observations. A global-intermediate-local (GIL) hierarchical approach based on the finite element method was used to obtain the solutions.

CONFIGURATIONS AND LOADING

The configuration analyzed in this study was a countersunk rivet hole in a plate with a half-height to width ratio $H/W = 2$ as shown in figure1a. The straight-shank hole radius to plate half-width ratio (W/R) was 5. For all calculations, the total angle subtended by the countersunk hole was 100°. The ratio of the length of the straight-shank portion of the hole to the plate thickness (h/t) was varied from 0.05, 0.25, and 0.50. The plate modulus of elasticity was E = 1, and Poisson's ratio was $\nu = 0.3$.

Three loading conditions were considered in this study, a remote tension (S_t), remote bending (S_b), and wedge (P_y) load were applied as shown in figures 1b, 1c, and 1d, respectively. A remote tension load was applied using a constant stress, S_t = 1.0 unit force per unit area. A remote bending load was applied using a linear stress distribution through-the-thickness. On the side of the countersunk bore (Z/t = 0.0), S_b = 1.0 unit force per unit area and on the side of the straight-shank hole (Z/t = 1.0), S_b = 0.0 unit force per unit area. This ensured an opening displacement of the crack surfaces. The wedge load condition was applied on the plane of symmetry of the countersunk hole. The wedge load, P_y, was defined as the vertical component of a traction, P_w, acting normal to the surface. This is shown in figure 1e, where P_w = 1.0 unit force per unit length. The value for the applied wedge load in this study was the following

$$P_y = \begin{cases} P_w & 0 \le \dfrac{Z}{t} \le \dfrac{h}{t} \\ P_w \cos 50° & \dfrac{h}{t} < \dfrac{Z}{t} \le 1 \end{cases} \tag{1}$$

The five crack locations shown in figure 1f were analyzed. All cracks were elliptical with the center of the ellipse at the corner of the rivet hole. The corner is defined by the intersection of the straight shank portion of the rivet hole and the inner surface of the plate. The size and shape of each crack is defined by a and c, the two elliptical axes, where a is parallel to the Z-axis and c is parallel to the Y-axis. At crack location 1, the crack is a corner crack with the value of a set to $h/2$ and h/t was varied from 0.05, 0.25, and 0.5. At crack location 2, also a corner crack, a was set equal to h, thus one end of the crack front intersected the knee of the countersunk rivet hole; h/t was varied as before. At crack location 3, a breakthrough crack, a was defined such that one end of the crack front would intersect the surface of the rivet hole in the countersunk region half way between the knee and the lip of the countersunk rivet hole. At this location, $Z/t = (h+t)/2t$; h/t was varied as before. At crack location 4, a through-the-thickness break-through crack, a was defined such that the crack would intersect the surface of the rivet hole at the lip of the countersink. At location 4, $Z/t = 1$; h/t was varied as before. For crack locations 1 through 4, a/c was varied from 1, 0.75, and 0.5. At crack location 5, only one crack shape was analyzed, a

breakthrough crack having $a/c = 1$ with $c/t = 3.125$. These cracking configurations were selected to represent typical scenarios observed during fractographic examinations reported in reference 12. The full analysis matrix shown in table 1 consists of 117 solutions.

BOUNDARY CORRECTION FACTOR

The mode I stress-intensity factor (K_I) at any location along the crack front under tensile loading is given as [13]

$$K_I = S_t \sqrt{\frac{\pi a}{Q}} F_t\left(\frac{a}{t}, \frac{a}{c}, \frac{h}{t}, \frac{R}{t}, \theta\right) \tag{2}$$

for bending load

$$K_I = S_b \sqrt{\frac{\pi a}{Q}} F_b\left(\frac{a}{t}, \frac{a}{c}, \frac{h}{t}, \frac{R}{t}, \theta\right) \tag{3}$$

and for wedge load

$$K_I = S_w \sqrt{\frac{\pi a}{Q}} F_w\left(\frac{a}{t}, \frac{a}{c}, \frac{h}{t}, \frac{R}{t}, \theta\right) \tag{4}$$

where the wedge load, S_w, is simulated using a normal wedge load P_w as

$$S_w = \frac{P_w}{t} \tag{5}$$

The boundary correction factor (BCF), F_t (tensile), F_b (bending), and F_w (wedge load) were calculated along the crack front for the various combinations of parameters (a/c, h/t, and crack location) shown in table 1. The crack dimensions, a and c, and the physical angle, θ, are defined in figure 1g. The physical angle, θ, is measured along the elliptical crack front from the inner surface of the plate to the hole boundary. The shape factor, Q, is given by the square of the complete elliptic integral of the second kind [14]. The integral can be approximated by [13]

$$\left.\begin{aligned} Q &= 1 + 1.464\left(\frac{a}{c}\right)^{1.65} \quad \text{for} \frac{a}{c} \leq 1 \\ Q &= 1 + 1.464\left(\frac{c}{a}\right)^{1.65} \quad \text{for} \frac{a}{c} > 1 \end{aligned}\right\} \tag{6}$$

For all the solutions generated in this work $\frac{a}{c} \leq 1$, thus the first expression in equation 6 is relevant in the context of this work.

GLOBAL-INTERMEDIATE-LOCAL HIERARCHICAL APPROACH

The global-intermediate-local (GIL) hierarchical finite element approach, illustrated in figure 2 and established and verified in reference 14, was used to obtain the boundary correction factors for countersunk rivet holes. The commercially available finite element program ABAQUS 5.6 [15] was used for the analysis. In the first step (global level) of the GIL approach, an analysis of the plate subjected to the prescribed loading conditions and using a relatively coarse mesh is conducted. For the cases analyzed here, due to symmetry in the geometry and loading, one quadrant of the plate was modeled. The global model typically contained 1200 twenty-noded brick elements.

In the next stage (intermediate level), an analysis of the area of interest using a more refined mesh is conducted; in these cases the area of interest was the higher stress gradient region near the hole. The intermediate model typically consisted of 5000 twenty-noded brick elements. The boundary conditions for the intermediate model were taken from the global model using the submodeling features in ABAQUS.

In the final stage (local level), an analysis is conducted that is even more focused on the region of interest; in these cases it was the region around the crack front. A highly refined mesh was used. The boundary conditions for the local model were taken from the intermediate model again using the submodeling features in ABAQUS.

From local models, the J-integral was calculated along the crack front using the equivalent domain integral method (EDIM). For cases where there is no mixed-mode fracture and plane strain elastic material response can be assumed, the mode I SIF at any point along the crack front can be calculated from the J-integral as

$$K_I = \sqrt{\frac{JE}{1-\nu^2}} \tag{7}$$

It should be noted that for the small cracks at locations 1 and 2, in figure 1f, the full GIL approach (three levels) was required. For the larger crack sizes at locations 3, 4, and 5, a two-level global-local hierarchical approach was adequate to obtain sufficiently accurate results. In the two-level approach, the global model had approximately 4500 twenty-noded brick elements, and the local model had 5600 twenty-noded brick elements.

RESULTS AND DISCUSSIONS

The parameters in table 1 were varied to the specified values yielding a total of 117 solutions. All results are reported as boundary correction factors, a nondimensional form of the stress-intensity factor. The results for boundary correction factors under tension are plotted as a function of physical angles in figures 3 through 15. The data are also presented in tabular form in tables 2 through 14. Corresponding figures for bending load are presented in figures 16 through figure 28 and the tabular data in tables 15 through 27. The results for wedge loading cases are presented in figures 29 through 41 and tables 28 through 40. The results are grouped for each crack location and loading case. It was noted that while the magnitude of boundary correction factor was a function of loading mode, the trends were similar for each loading mode.

In the following discussion the emphasis is placed on the tension mode results, but the arguments apply equally well to the bending and wedge loading cases.

EFFECT OF CRACK SHAPE ON BOUNDARY CORRECTION FACTOR.

The boundary correction factors under tension, F_t, for cracks at location 1 are shown in figure 3 as a function of the physical angle, θ. The results are for $h/t = 0.05$. The shape of the elliptical cracks was varied from $a/c = 1$, 0.75, and 0.5. The value of a was held constant and the value of c varied to obtain the desired a/c ratio. In general, for all three a/c ratios, the value of the boundary correction factor increased with an increase in the physical angle (i.e., as one moved along the crack front from the inner surface of the plate to the hole boundary). As shown in the figure 3, for small values of θ, (near the inner or faying surface of the plate), values of boundary correction factors increased directly with the value of a/c. Smaller a/c values mean a larger value c and thus the crack front is further away from the corner and therefore has a relatively lower BCF. With increasing values of θ (towards the boundary of the hole), the solutions for the three values of a/c merged. This is expected since all three cracks considered here have the same value of a and consequently approach the same point on the hole boundary. At $\theta = 90°$, the value of the boundary correction factor is highest for all three crack shapes, i.e., as one approaches the hole boundary. Similar trends were observed at other crack locations and h/t ratios. For breakthrough cracks the crack fronts do not intersect the straight-shank hole boundary but terminate at a point on the outer surface. The boundary correction factor is highest at the point where the crack intersects. The effect of a/c ratio on these breakthrough cracks (at locations 4 and 5) is slightly different than those discussed earlier. As a typical example one may look at figure 12. Here for $h/t = 0.05$, boundary correction factors are plotted for three crack shapes with a/c of 1.00, 0.75, and 0.50. These cracks are at location 4. To obtain the different crack shapes, a and c were adjusted such that the required a/c was obtained and the crack front passed through the lip of the countersink. As before, the crack fronts with larger a/c ratios are closer to the hole boundary. In this case, however, at $\theta = 0°$ the crack front is relatively far from the hole, so its effect on the boundary correction factors is almost negligible. On the other hand at higher values of θ, as one moves along the crack front towards the outer surface boundary, the BCF diverge from each other and actually the crack front with the lowest a/c value results in the highest boundary correction factor. This can be explained by observing that for through cracks, the lower the value of a/c, the narrower is the uncracked ligament near the outer surface.

EFFECT OF CRACK LOCATION ON BOUNDARY CORRECTION FACTOR.

The boundary correction factors under tension, F_t, as a function of the physical angle, θ, for $a/c = 1$ and $h/t = 0.25$ are shown in figure 42. The figure shows F_t for all five locations of the crack considered in this work. In general, at each location, as one moves along the crack front from the inner surface of the plate towards the outer surface and hole boundaries (increasing θ), the value of the boundary correction factor increases. Thus, for all crack locations, the hole and outer surface boundaries have more of an effect on the value of the boundary correction factor than the inner surface boundary of the plate. For crack locations 1 and 2, the entire crack front is near the hole (compared to the other three locations) and the values of the boundary correction factor are higher. The highest value for boundary correction factors were found for cracks at location 2 at points on the crack front at larger values of θ, where the crack front meets the

countersunk hole at the knee. Here the crack front intersects the hole boundary at a point of abrupt geometry change, consequently the value of the BCF is higher. In general the further a point on the crack front is away from the boundary, the lower is the value of the boundary correction factor. Among the boundaries, the hole surface boundary and the outer surface have the greatest influence on the value of the boundary correction factor. Similar trends were observed at different *a/c* and *h/t* ratios.

The boundary correction factors under tension, F_t, as a function of the physical angle, θ, for $a/c = 1$ and $h/t = 0.05$ are shown in figure 43. Similar trends are observed as for the case with $h/t = 0.25$ shown in Figure 42. That is, the boundary correction factors increase with an increase in the physical angle, and the values are highest for the crack fronts nearer the hole at locations 1 and 2. In comparing the results from figures 42 and 43, the effect of changing *h/t* on the boundary correction factor is evident. For crack locations 3, 4, and 5, where the influence of the hole is lessened, the values of F_t are similar for the two values of *h/t*. However, at crack locations 1 and 2, the change in *h/t* results in a significant difference in the boundary correction factors. For $h/t = 0.05$, figure 43, a near knife edge condition exists resulting in a much higher stress gradient region in the straight-shank portion of the hole compared with the case where $h/t = 0.25$. Consequently, the boundary correction factors for the crack fronts near the hole boundary at locations 1 and 2 are higher for $h/t = 0.05$ compared with $h/t = 0.25$.

EFFECT OF APPLIED LOADING ON BOUNDARY CORRECTION FACTORS.

The boundary correction factors under bending, F_b, and wedge loading F_w, as a function of the physical angle, θ, for *h/t* of 0.25 are shown in figures 16 through 41. Each figure shows the results for values of $a/c = 1$, 0.75, and 0.5. Similar trends are observed for both the bending and wedge loading as for the tension load case shown in figures 3 through 15. The values of boundary correction factors increased with an increase in physical angle as one moved along the crack front from the inner surface towards to the hole boundary or the outer surface. For small values of θ near the inner surface, the boundary correction factor increased with an increase in the value of *a/c*. At locations 1 and 2, with increasing values of θ, as one moved along the crack front toward the hole boundary, the values of the solutions for each of the three *a/c* ratios merged. Also at locations 3, 4, and 5 the behavior for bending and wedge load parallels that observed for tension.

CONCLUDING REMARKS

The expansion of the database of known stress-intensity factor (SIF) solutions of cracks emanating from countersunk rivet holes under tension, bending, and wedge load conditions has been undertaken in this study. Results were generated for 117 different configurations. The crack size, shape, and location were selected to represent typical experimental observations. The crack shapes were selected using the ratio of the elliptical crack length in the thickness direction to that in the width direction, $a/c =$ 0.5, 0.75, and 1. In addition the ratio of the length of the straight-shank portion of the hole to the plate thickness (*h/t*) was varied ranging from 0.05, 0.25, and 0.50. Cracks at five locations were analyzed: (1) corner cracks passing through the middle of straight-shank portion of the rivet hole; (2) corner cracks passing though inner knee of the rivet hole; (3) breakthrough cracks passing through the middle of the inclined surface of the

rivet hole; (4) breakthrough cracks passing through the upper knee of the rivet hole; and (5) through-the-thickness crack passing through the inner and outer surfaces of the plate.

A global-intermediate-local (GIL) hierarchical submodeling technique was used to generate the stress-intensity factor solutions. Results generated using the GIL approach were presented in terms of the boundary correction factors. The effect of the shape of the crack, the location of the crack, the length of the straight shank hole, and applied loading were presented. The boundary correction factor was determined along the crack front in terms of the physical angle measured from the inner surface of the plate to a point on the boundary of the crack front.

In general, the values of boundary correction factors increased as one moved along the crack front from the inner surface of the plate towards the hole boundary. For small physical angles, i.e., near the inner surface of the plate, the value of the boundary correction factor increased with an increase in the value of a/c. As the physical angle increased, i.e., at points on the crack front nearer the hole boundary, the boundary correction factor solutions for the three values of a/c merged. For the five crack locations considered, the inner surface of the plate had less of an influence on the boundary correction factor than the hole and outer surface boundaries. The values of the boundary correction factor were highest for the crack fronts closest to the hole boundary. The trends in the solutions were the same for the three loading conditions.

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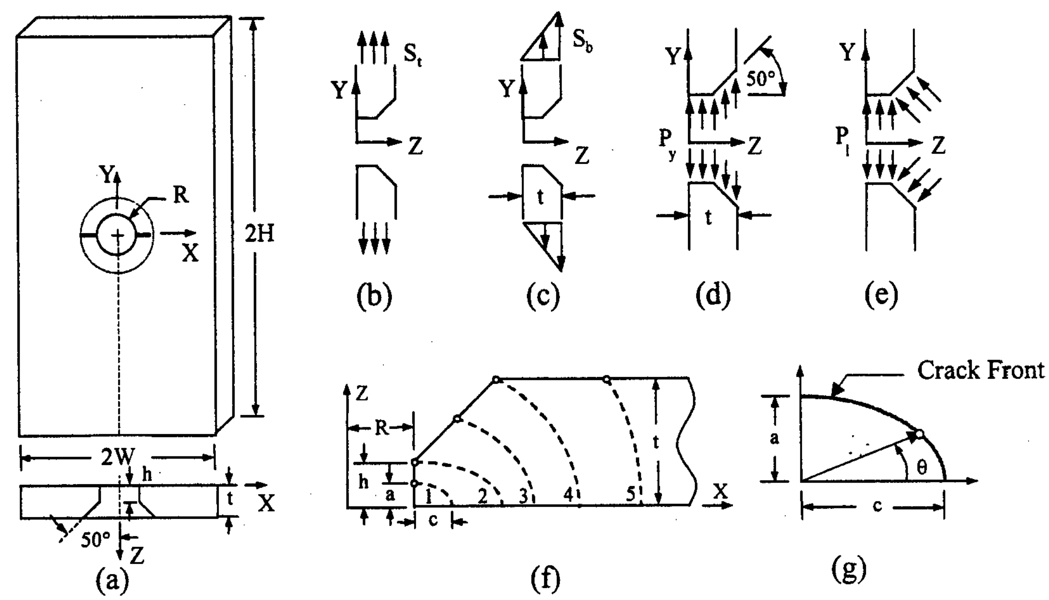

FIGURE 1. PROBLEM DESCRIPTION

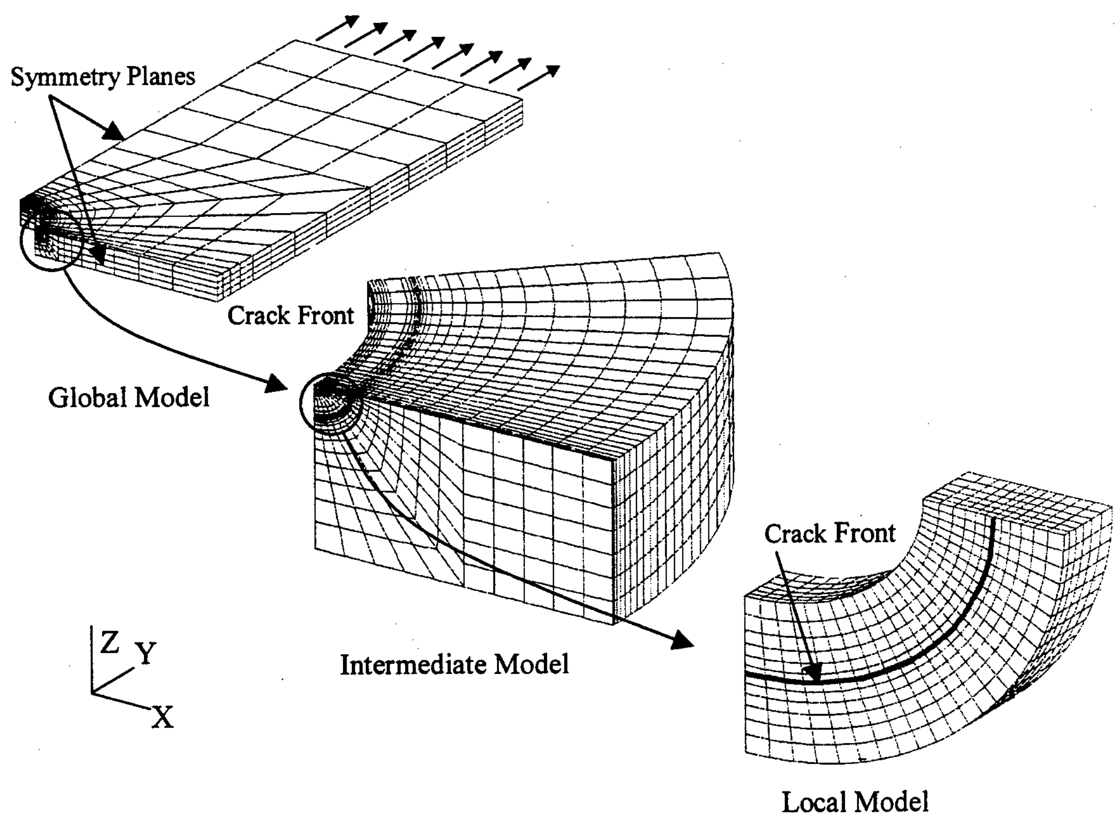

FIGURE 2. GLOBAL-INTERMEDIATE-LOCAL HEIRARCHICAL APPROACH

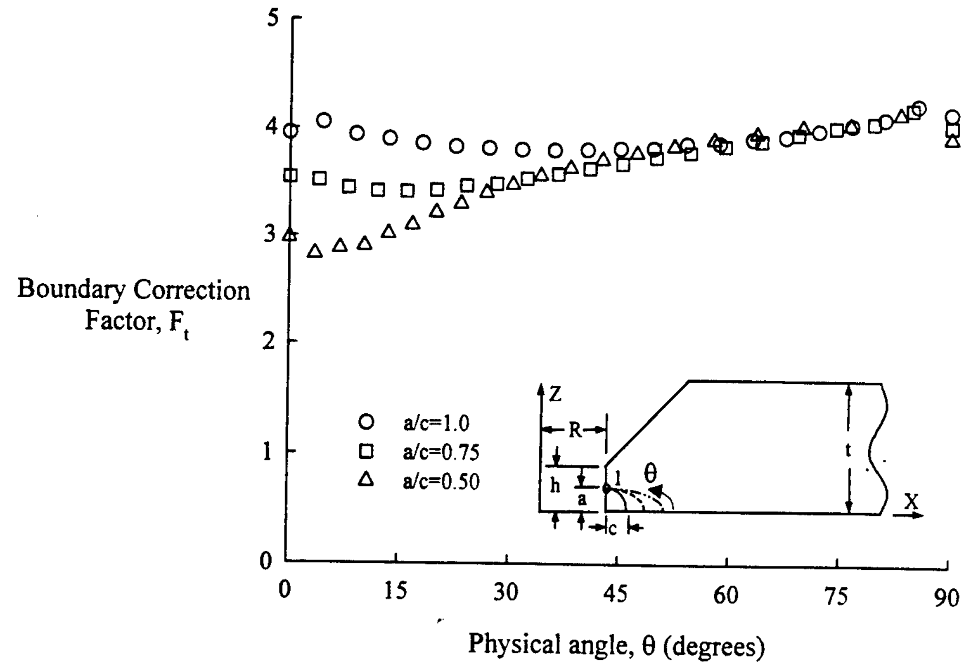

FIGURE 3. BOUNDARY CORRECTION FACTORS, F_t, FOR CRACK LOCATION 1 UNDER TENSION, h/t = 0.05

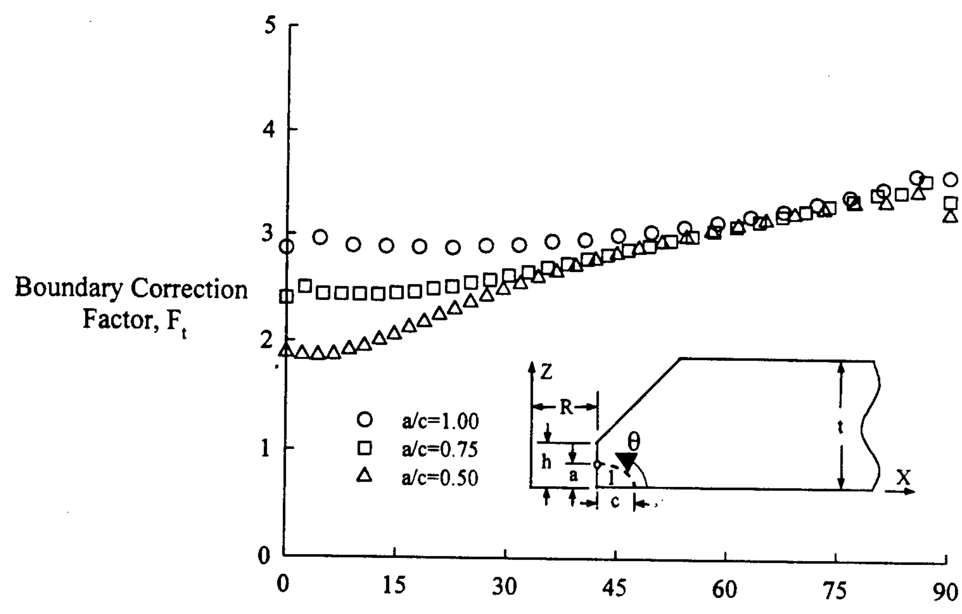

FIGURE 4. BOUNDARY CORRECTION FACTORS, F_t, FOR CRACK LOCATION 1 UNDER TENSION, h/t = 0.25

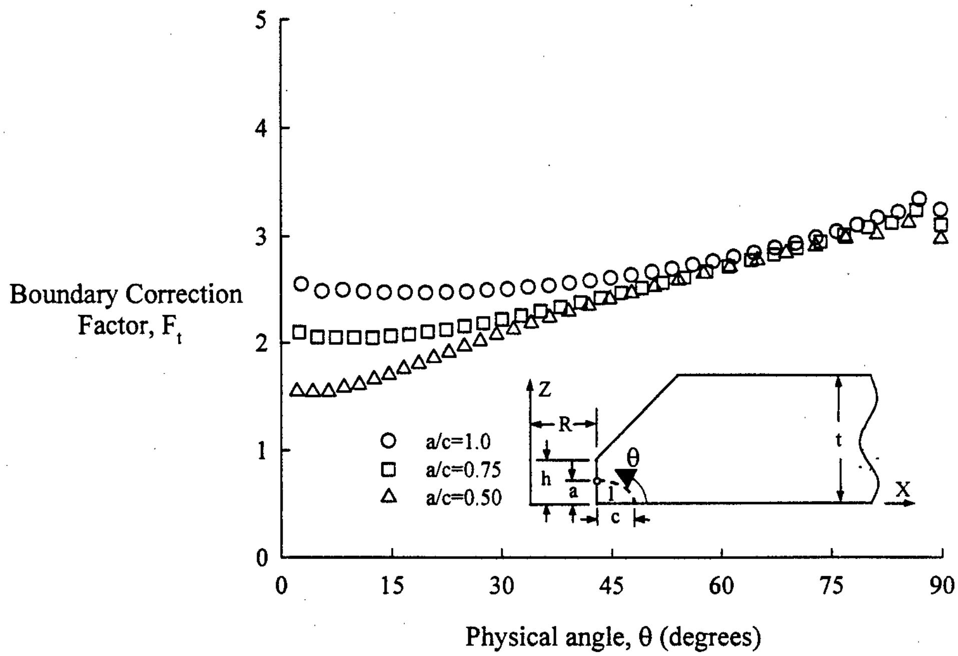

FIGURE 5. BOUNDARY CORRECTION FACTORS, F_t, FOR CRACK LOCATION 1 UNDER TENSION, h/t = 0.50

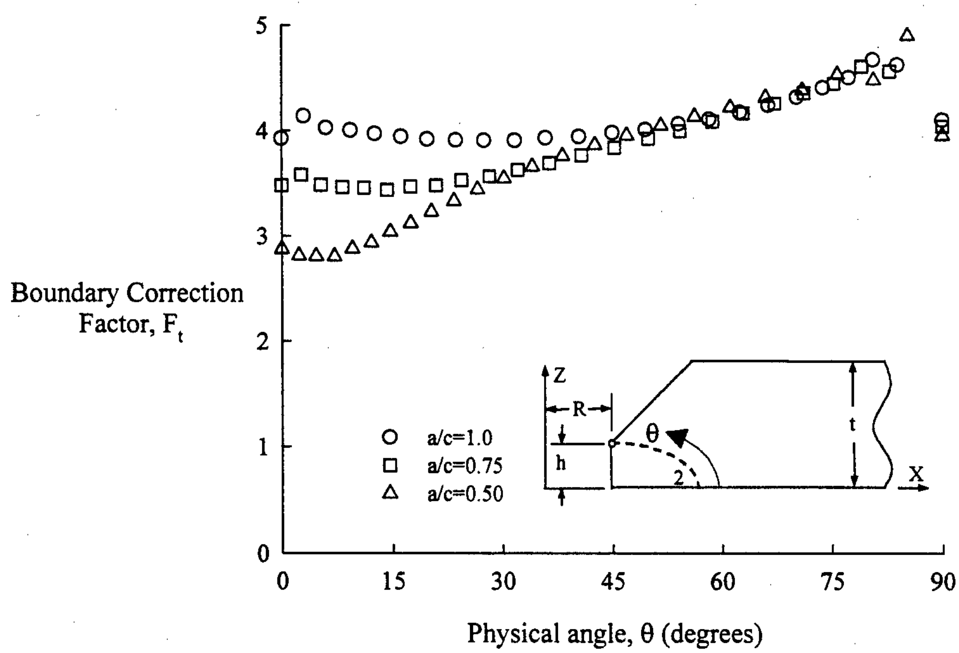

FIGURE 6. BOUNDARY CORRECTION FACTORS, F_t, FOR CRACK LOCATION 2 UNDER TENSION, h/t = 0.05

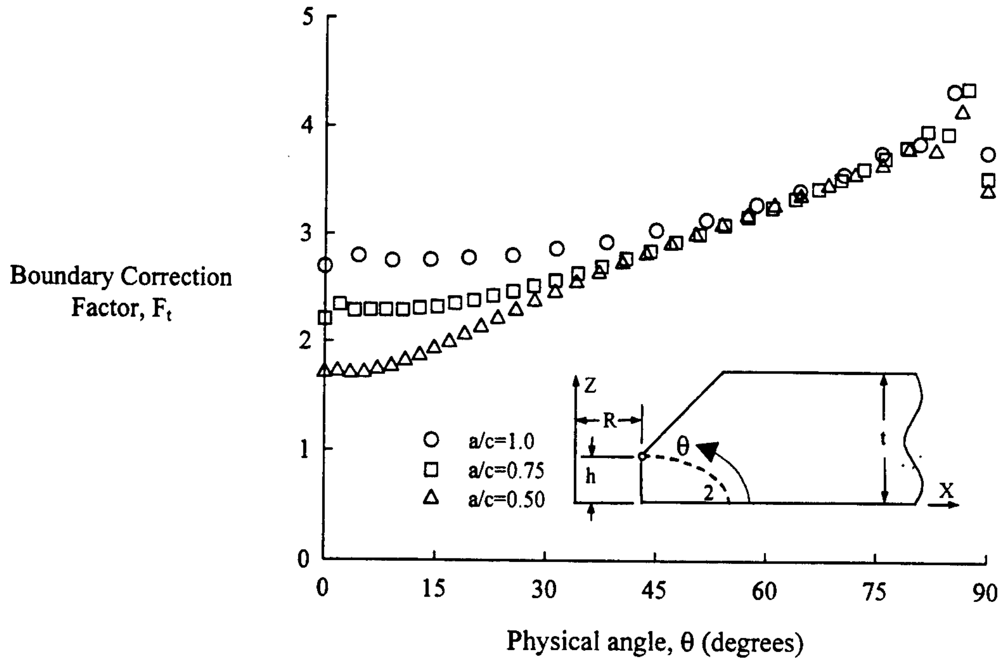

FIGURE 7. BOUNDARY CORRECTION FACTORS, F_t, FOR CRACK LOCATION 2 UNDER TENSION, h/t = 0.25

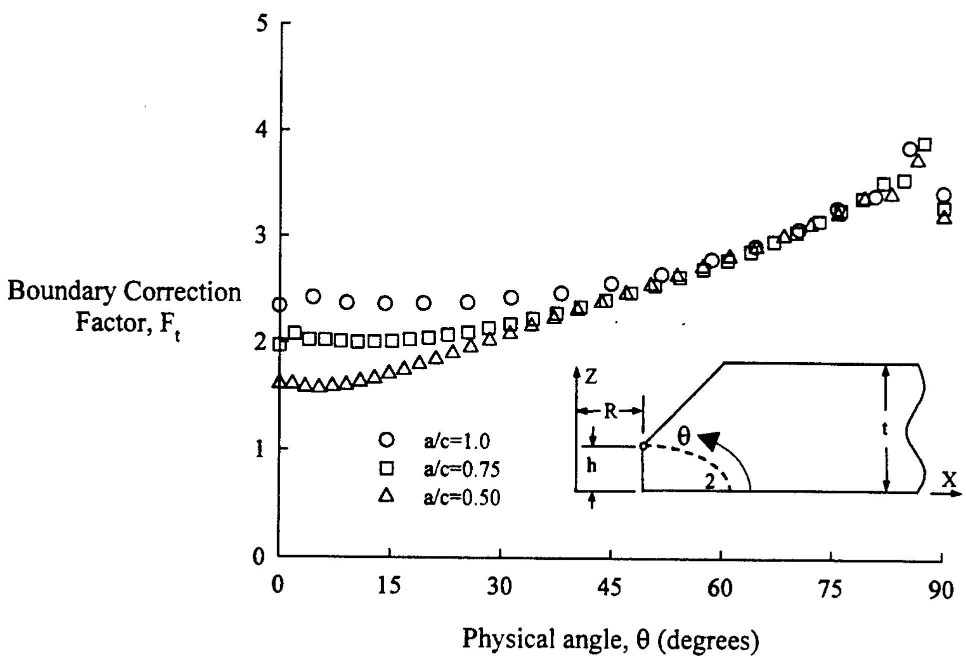

FIGURE 8. BOUNDARY CORRECTION FACTORS, F_t, FOR CRACK LOCATION 2 UNDER TENSION, h/t = 0.50

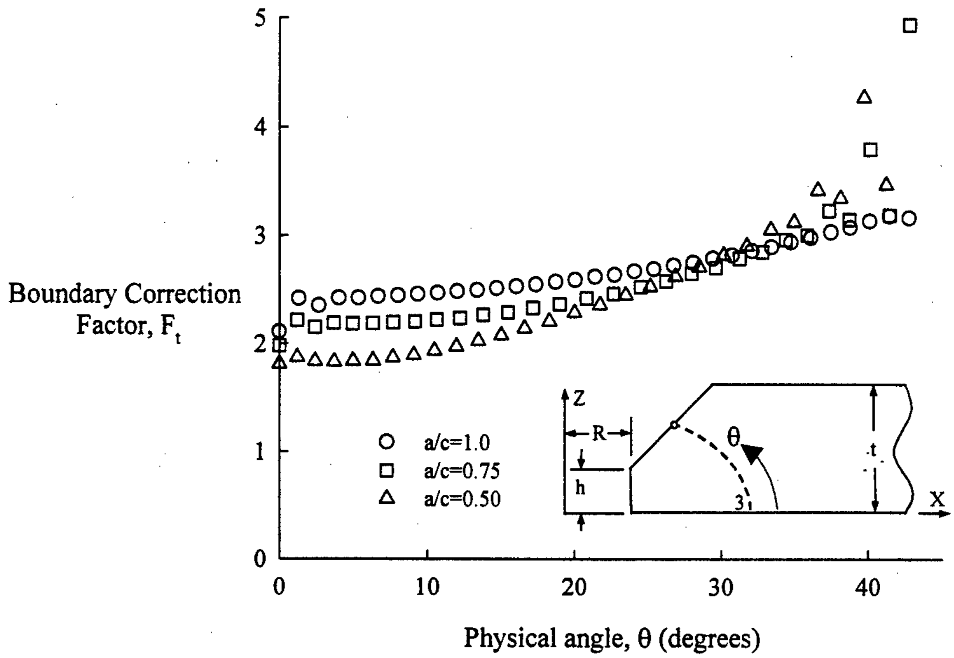

FIGURE 9. BOUNDARY CORRECTION FACTORS, F_t, FOR CRACK LOCATION 3 UNDER TENSION, h/t = 0.05

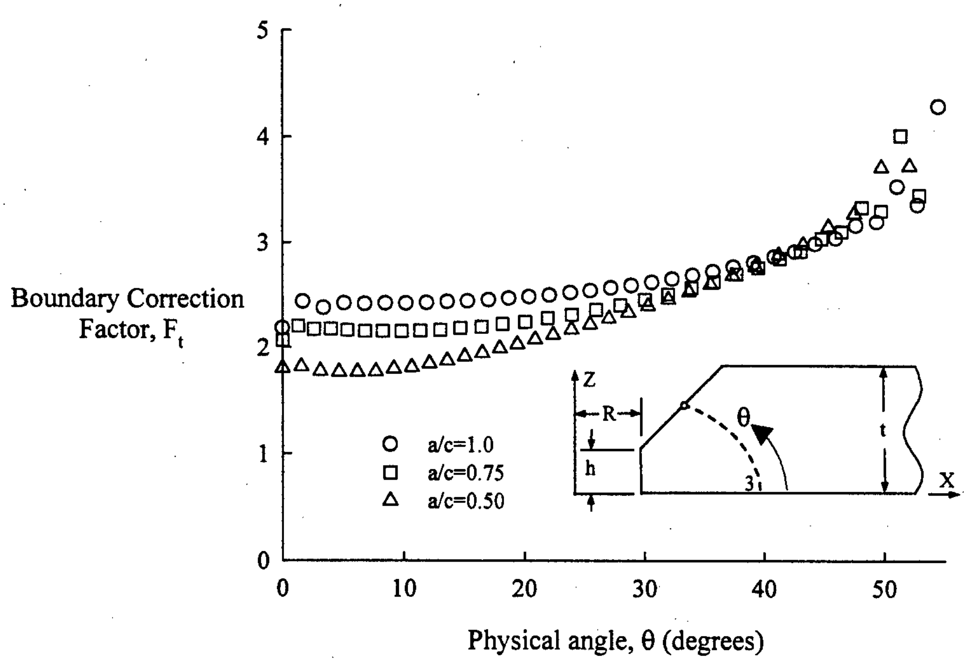

FIGURE 10. BOUNDARY CORRECTION FACTORS, F_t, FOR CRACK LOCATION 3 UNDER TENSION, h/t = 0.25

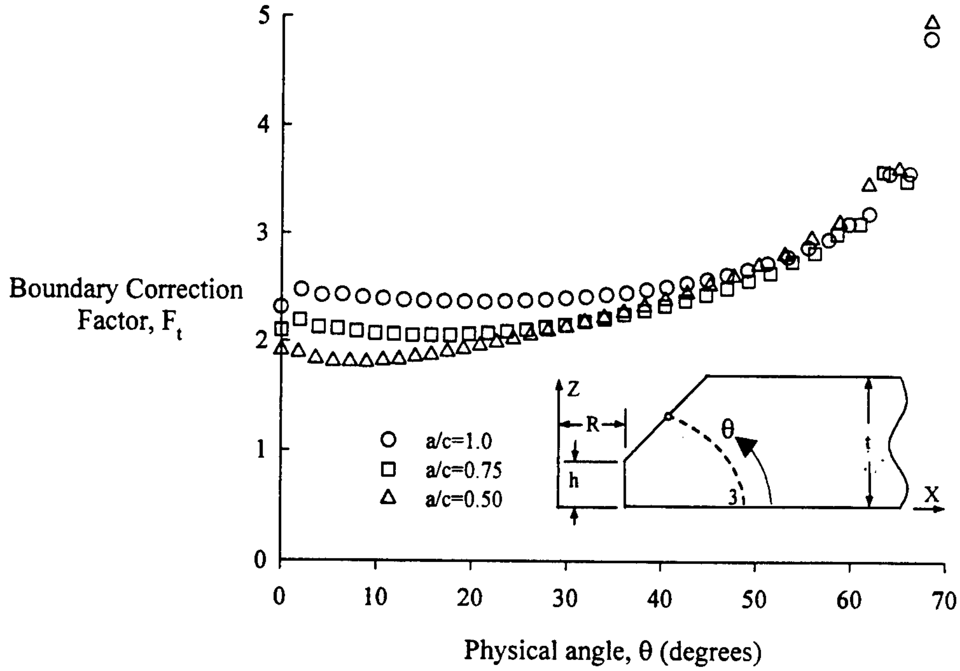

FIGURE 11. BOUNDARY CORRECTION FACTORS, F_t, FOR CRACK LOCATION 3 UNDER TENSION, h/t = 0.50

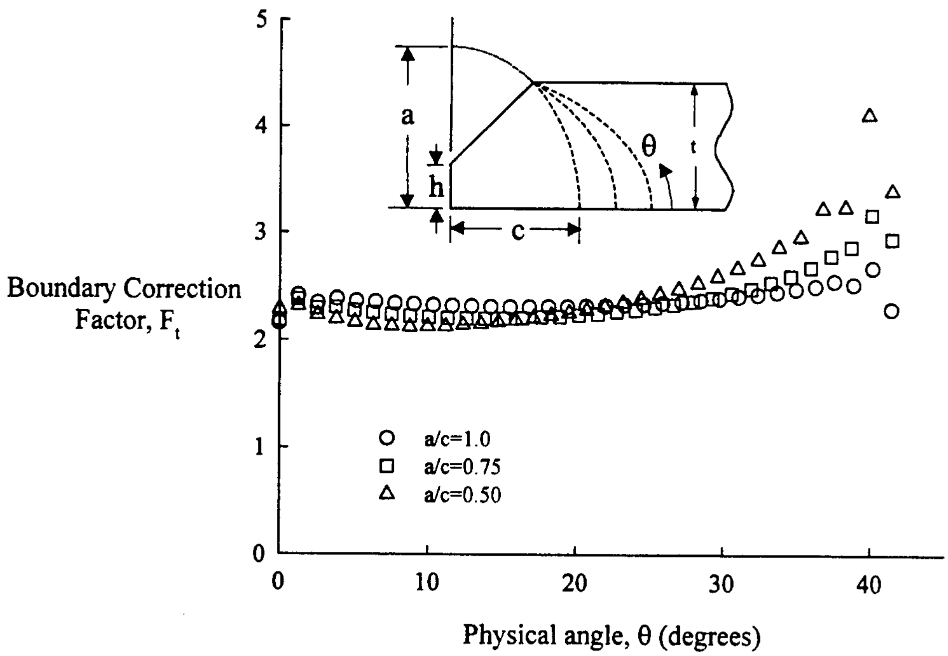

FIGURE 12. BOUNDARY CORRECTION FACTORS, F_t, FOR CRACK LOCATION 4 UNDER TENSION, h/t = 0.05

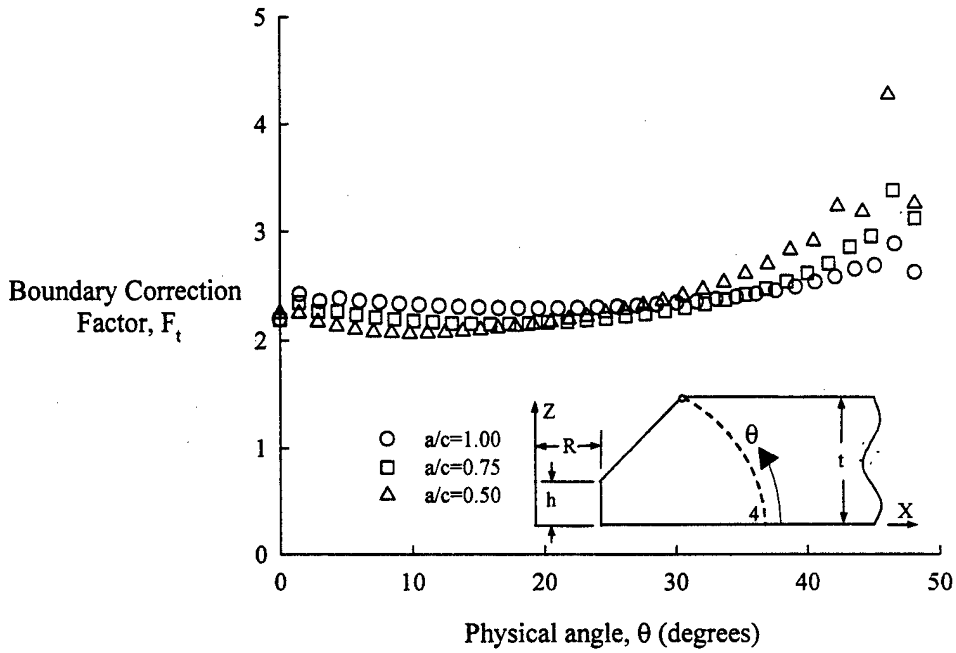

FIGURE 13. BOUNDARY CORRECTION FACTORS, F_t, FOR CRACK LOCATION 4 UNDER TENSION, $h/t = 0.25$

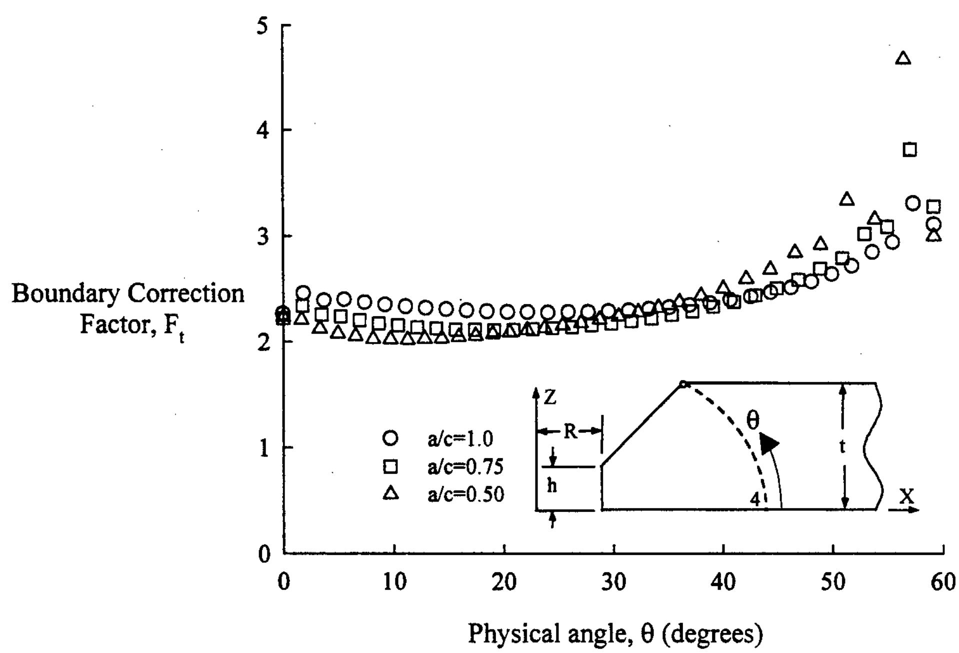

FIGURE 14. BOUNDARY CORRECTION FACTORS, F_t, FOR CRACK LOCATION 4 UNDER TENSION, $h/t = 0.50$

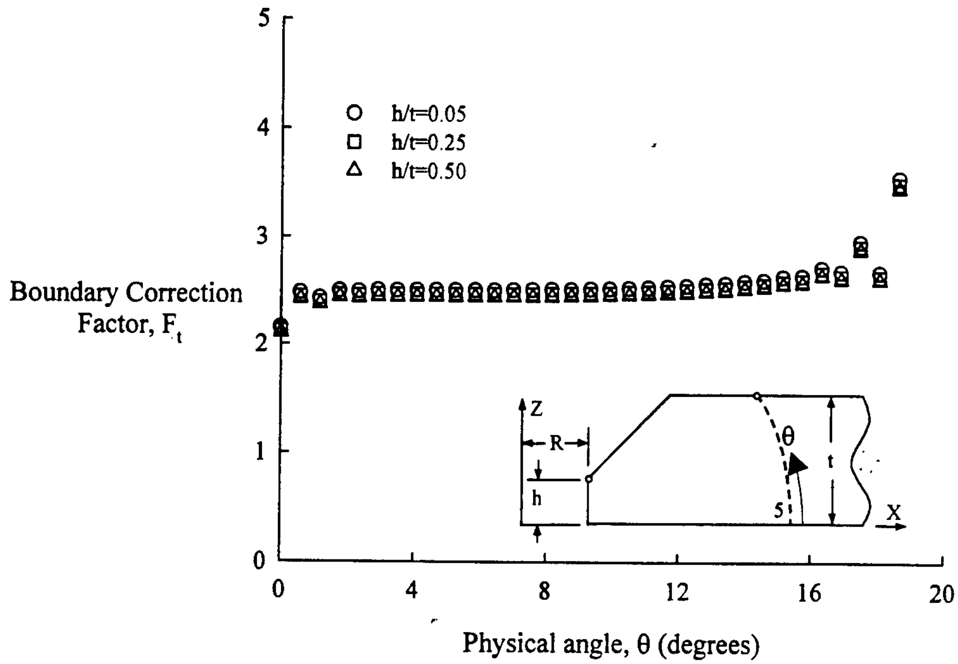

FIGURE 15. BOUNDARY CORRECTION FACTORS, F_t, FOR CRACK LOCATION 5 UNDER TENSION, h/t = 0.05, 0.25, 0.50; AND a/c = 1.0

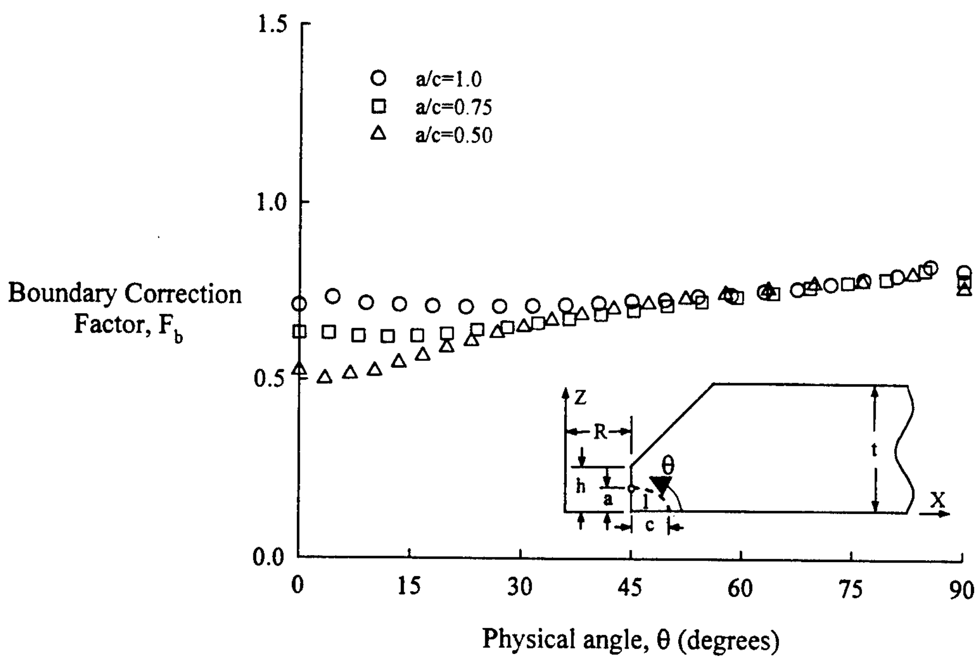

FIGURE 16. BOUNDARY CORRECTION FACTORS, F_b, FOR CRACK LOCATION 1 UNDER BENDING, h/t = 0.05

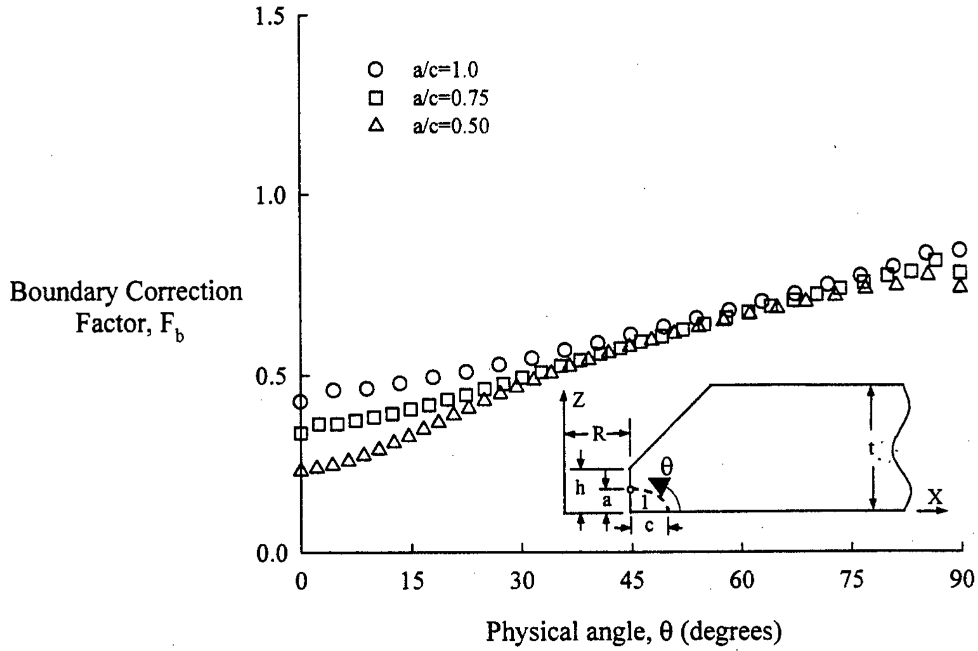

FIGURE 17. BOUNDARY CORRECTION FACTORS, F_b, FOR CRACK LOCATION 1 UNDER BENDING, h/t = 0.25

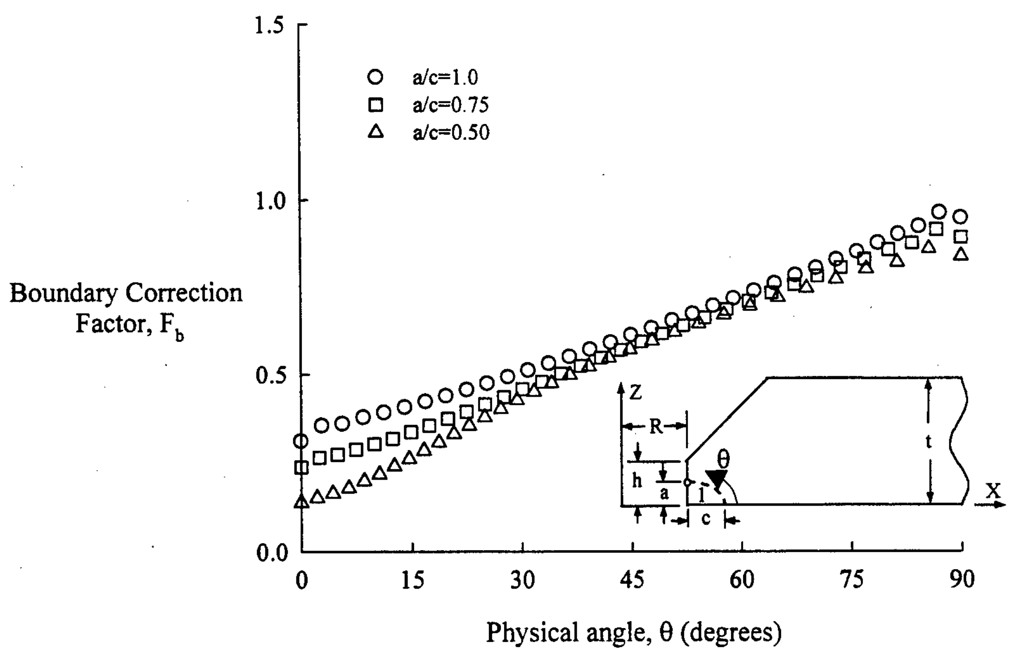

FIGURE 18. BOUNDARY CORRECTION FACTORS, F_b, FOR CRACK LOCATION 1 UNDER BENDING, h/t = 0.50

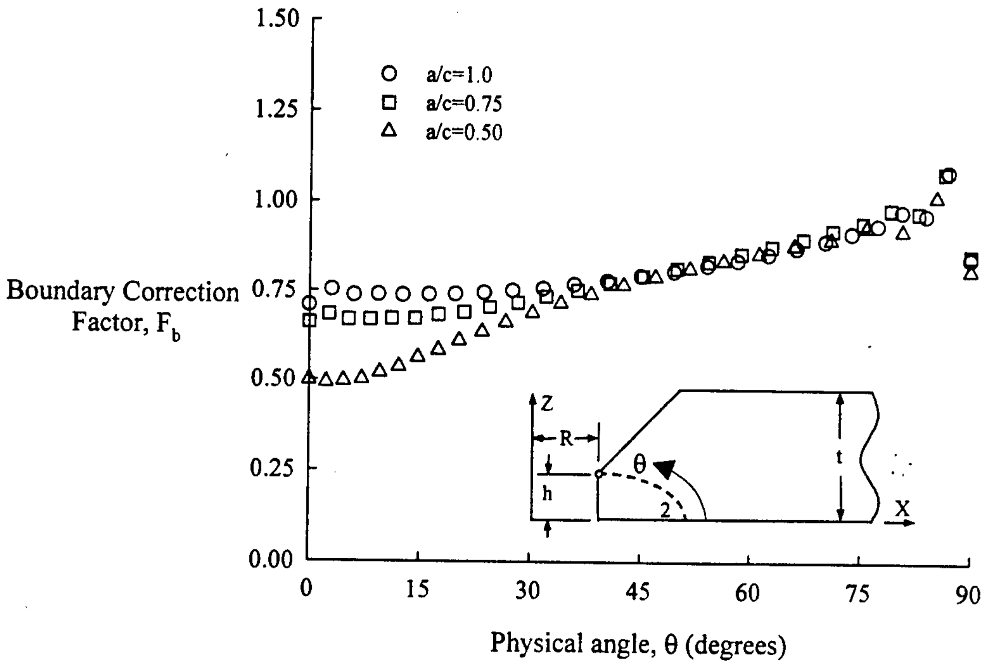

FIGURE 19. BOUNDARY CORRECTION FACTORS, F_b, FOR CRACK LOCATION 2 UNDER BENDING, h/t = 0.05

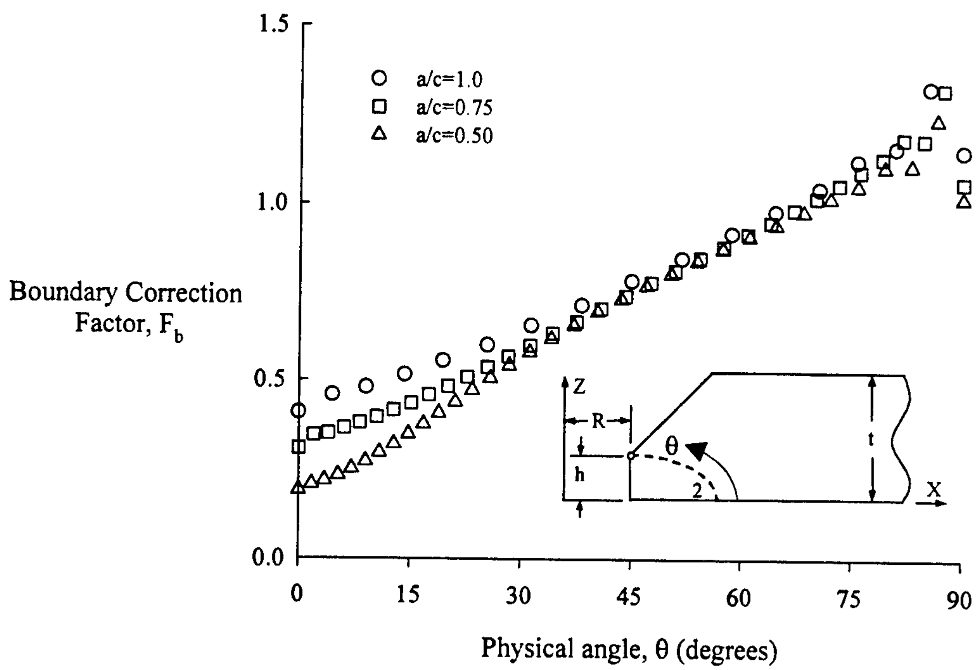

FIGURE 20. BOUNDARY CORRECTION FACTORS, F_b, FOR CRACK LOCATION 2 UNDER BENDING, h/t = 0.25

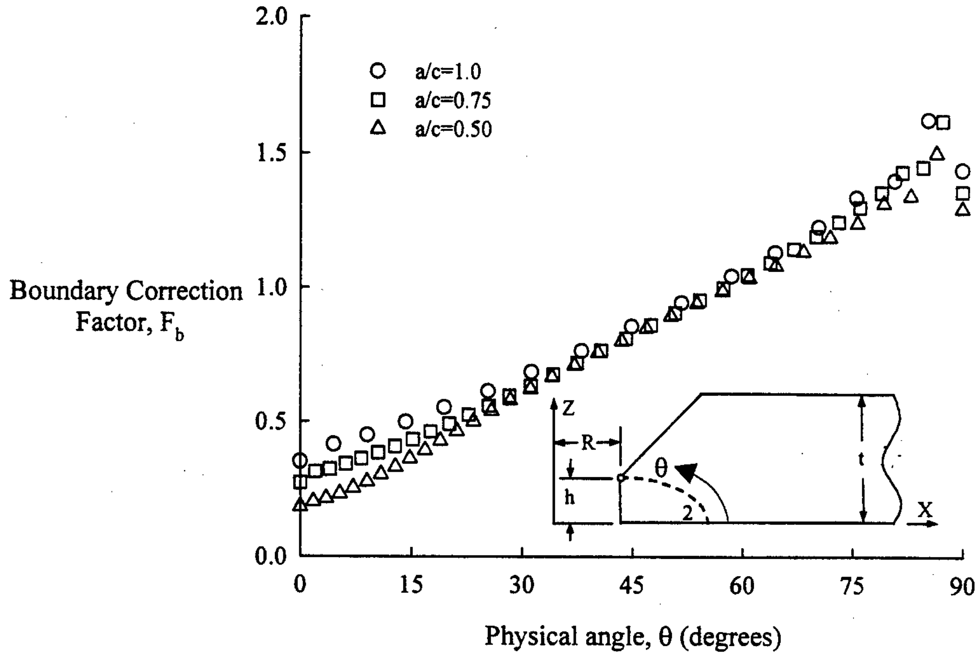

FIGURE 21. BOUNDARY CORRECTION FACTORS, F_b, FOR CRACK LOCATION 2 UNDER BENDING, h/t = 0.50

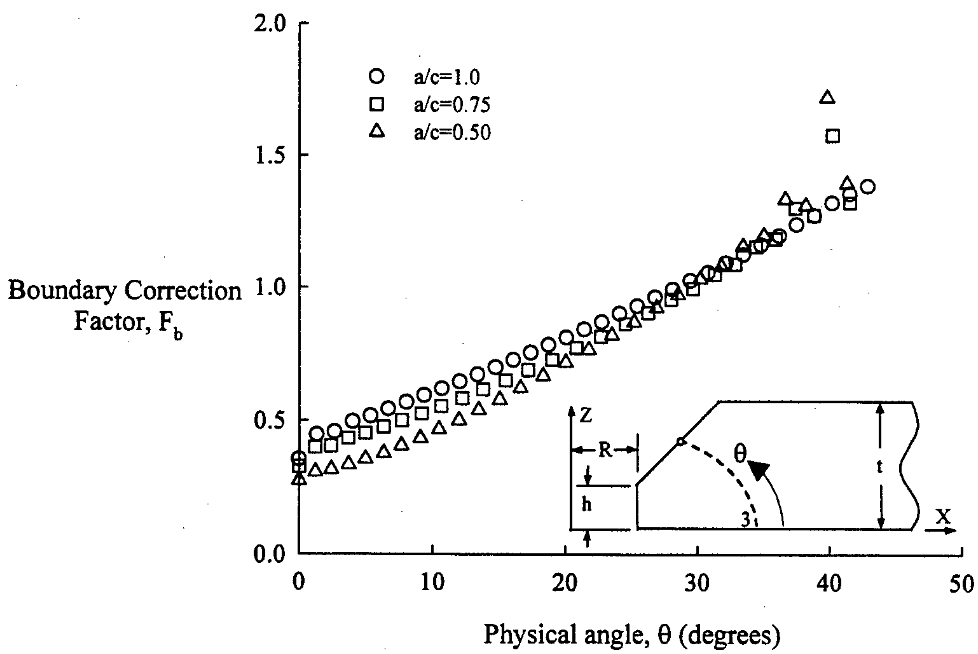

FIGURE 22. BOUNDARY CORRECTION FACTORS, F_b, FOR CRACK LOCATION 3 UNDER BENDING, h/t = 0.05

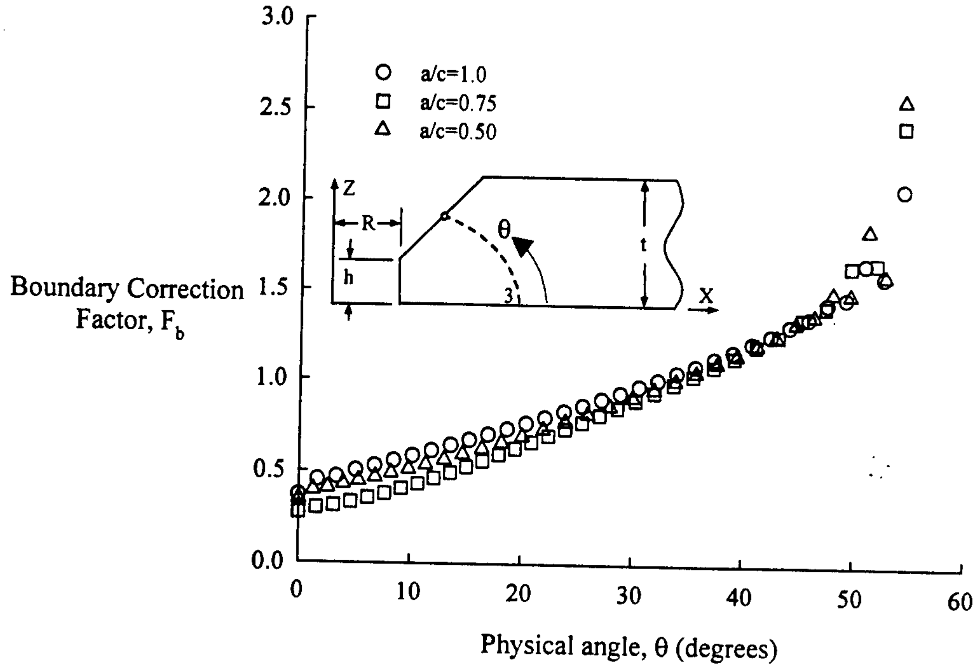

FIGURE 23. BOUNDARY CORRECTION FACTORS, F_b, FOR CRACK LOCATION 3 UNDER BENDING, h/t = 0.25

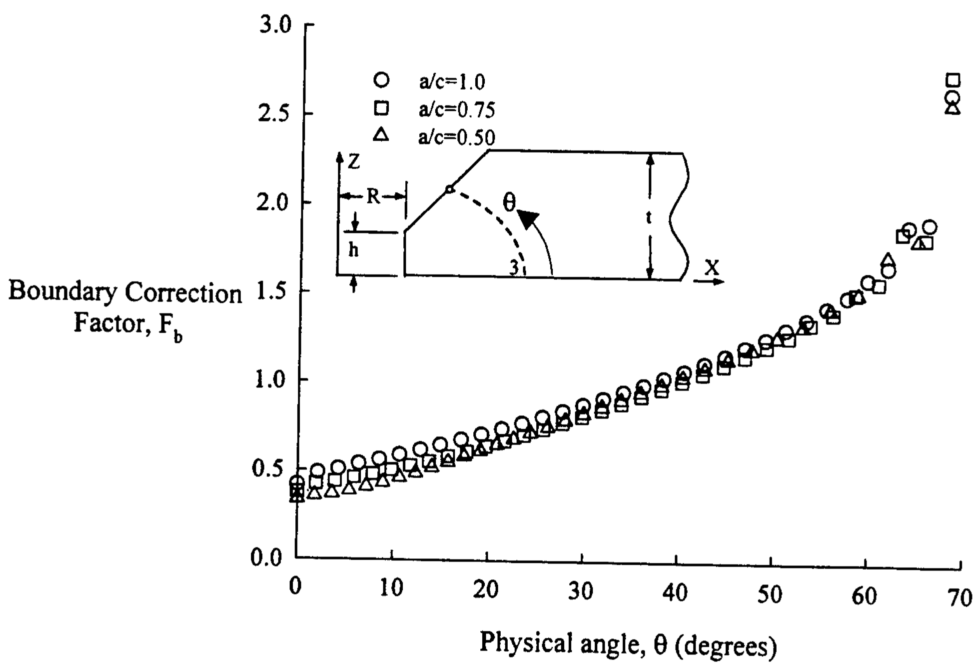

FIGURE 24. BOUNDARY CORRECTION FACTORS, F_b, FOR CRACK LOCATION 3 UNDER BENDING, h/t = 0.50

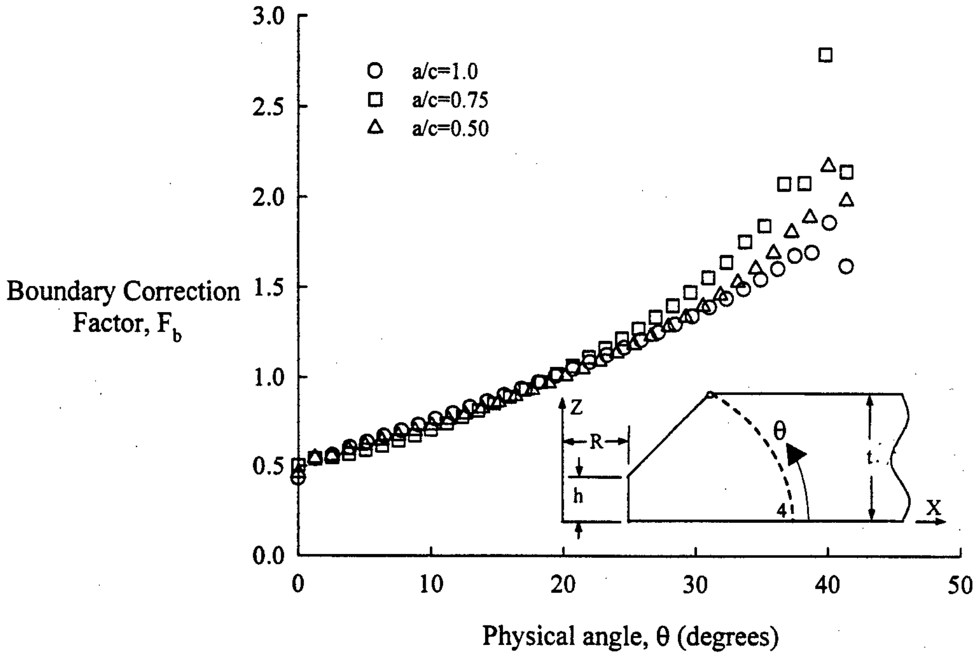

FIGURE 25. BOUNDARY CORRECTION FACTORS, F_b, FOR CRACK LOCATION 4 UNDER BENDING, h/t = 0.05

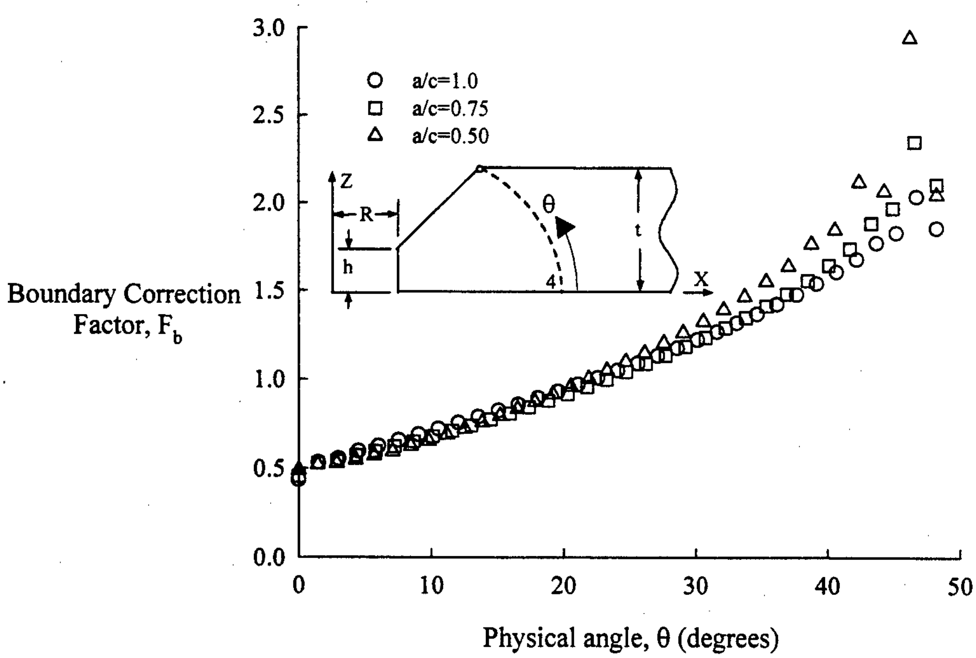

FIGURE 26. BOUNDARY CORRECTION FACTORS, F_b, FOR CRACK LOCATION 3 UNDER BENDING, h/t = 0.25

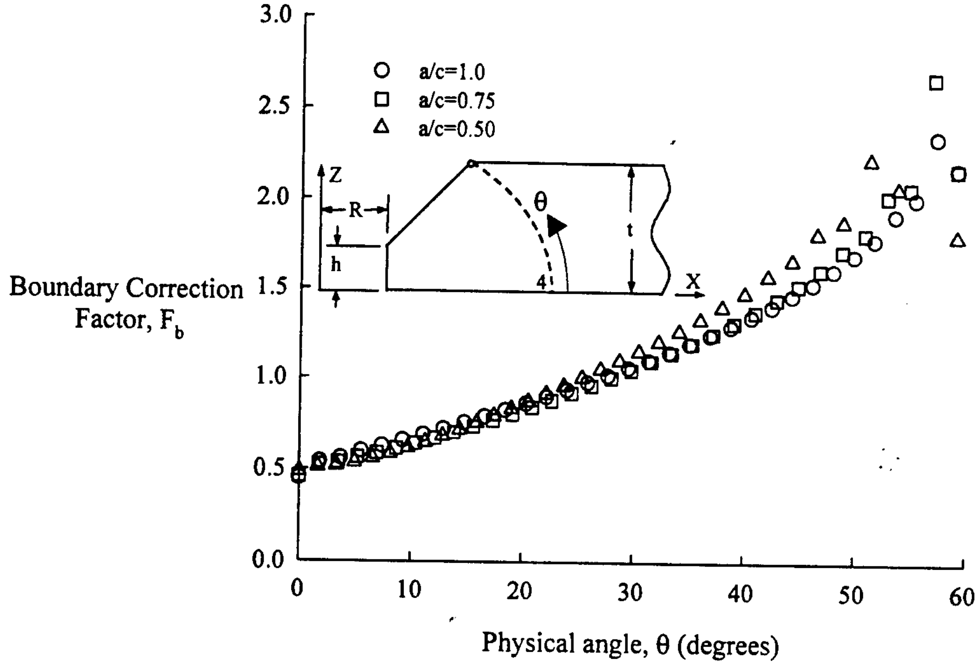

FIGURE 27. BOUNDARY CORRECTION FACTORS, F_b, FOR CRACK LOCATION 4 UNDER BENDING, h/t = 0.50

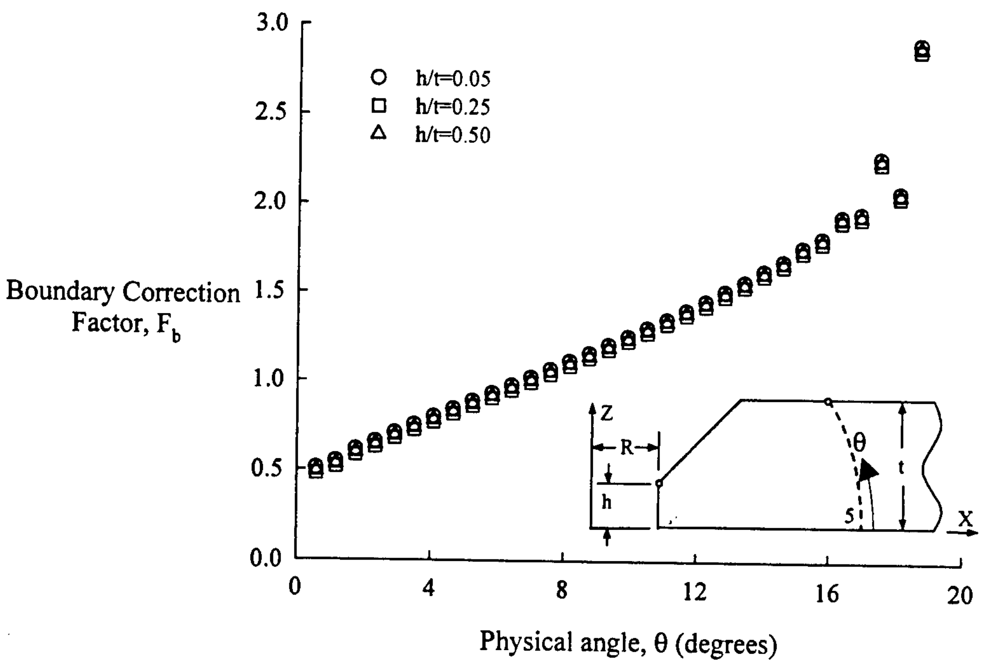

FIGURE 28. BOUNDARY CORRECTION FACTORS, F_t, FOR CRACK LOCATION 5 UNDER BENDING, h/t = 0.05, 0.25, 0.50; AND a/c = 1.0

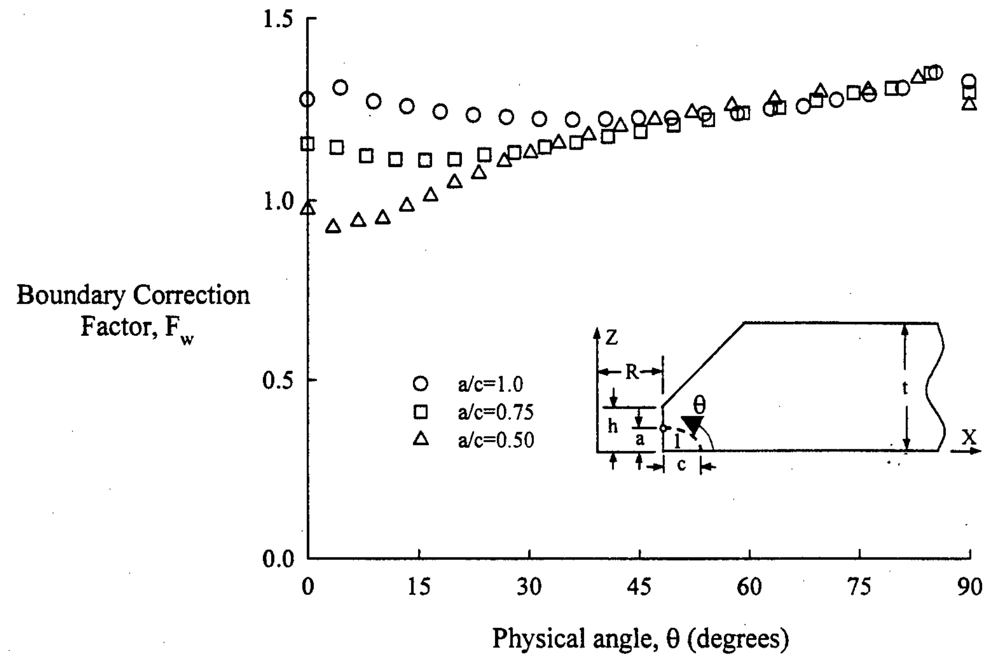

FIGURE 29. BOUNDARY CORRECTION FACTORS, F_w, FOR CRACK LOCATION 1 UNDER WEDGE LOADING, h/t = 0.05

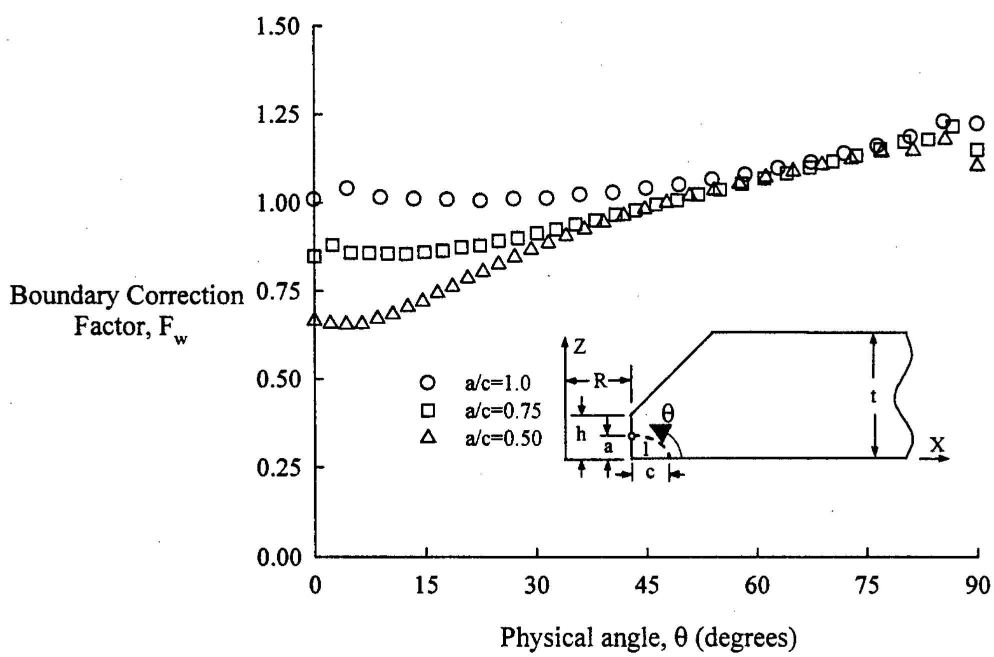

FIGURE 30. BOUNDARY CORRECTION FACTORS, F_w, FOR CRACK LOCATION 1 UNDER WEDGE LOADING, h/t = 0.25

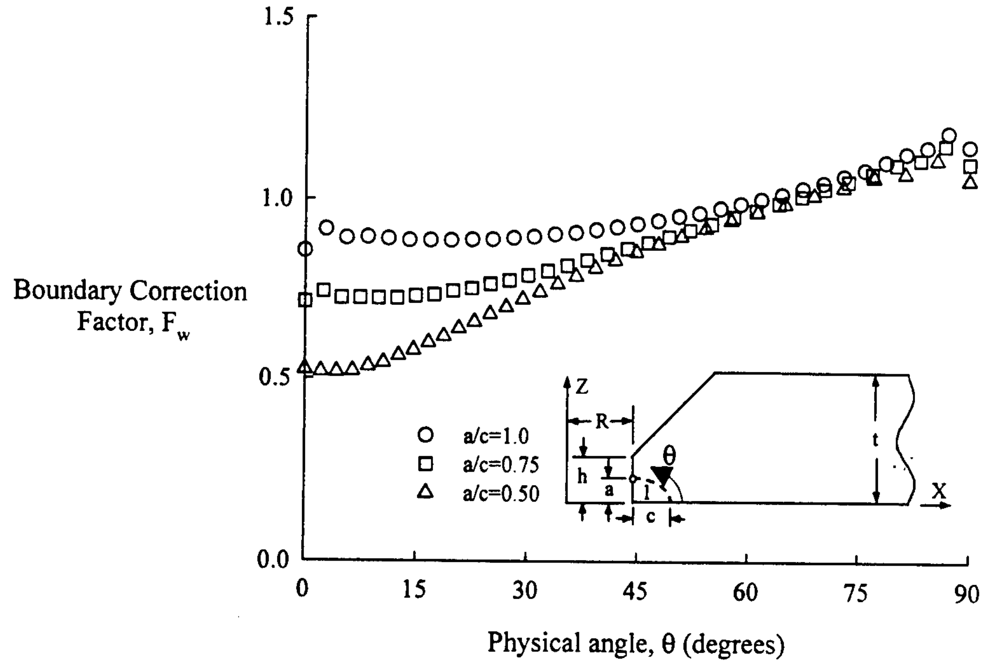

FIGURE 31. BOUNDARY CORRECTION FACTORS, F_w, FOR CRACK LOCATION 1 UNDER WEDGE LOADING, h/t = 0.50

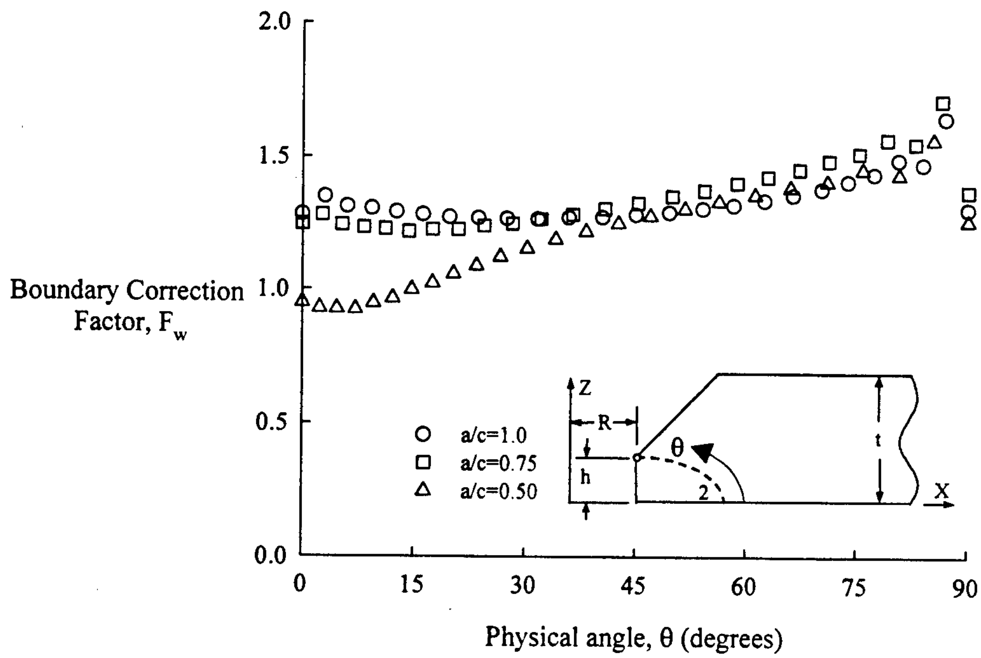

FIGURE 32. BOUNDARY CORRECTION FACTORS, F_w, FOR CRACK LOCATION 2 UNDER WEDGE LOADING, h/t = 0.05

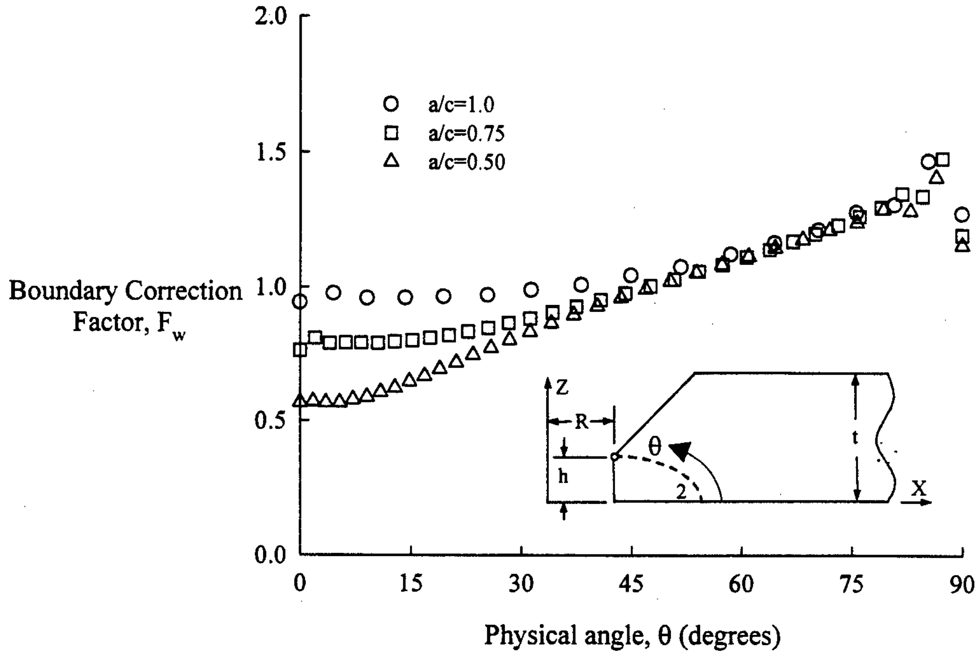

FIGURE 33. BOUNDARY CORRECTION FACTORS, F_w, FOR CRACK LOCATION 2 UNDER WEDGE LOADING, h/t = 0.25

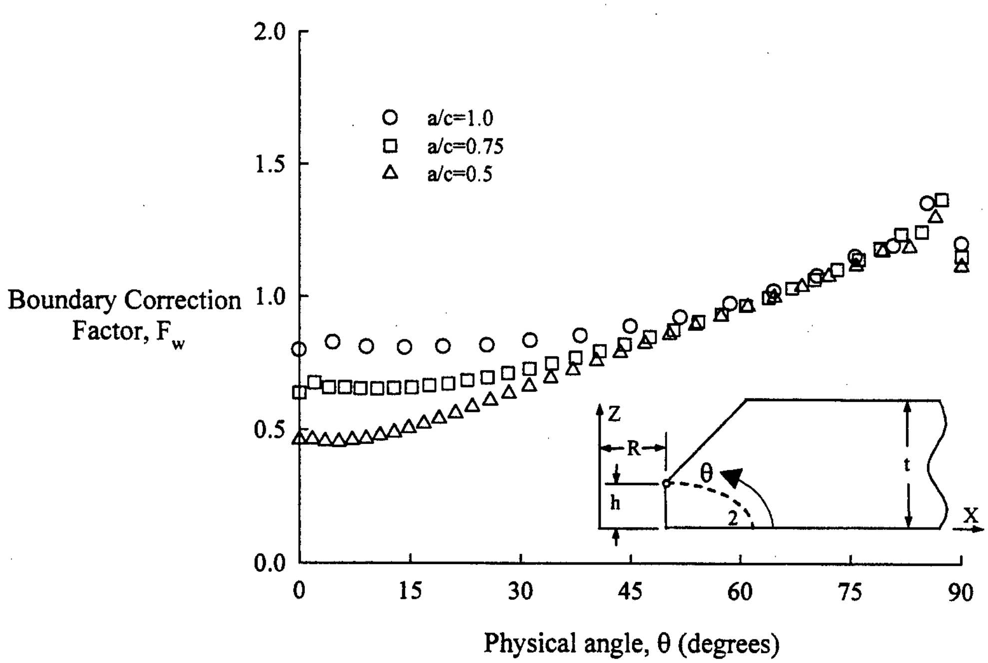

FIGURE 34. BOUNDARY CORRECTION FACTORS, F_w, FOR CRACK LOCATION 2 UNDER WEDGE LOADING, h/t = 0.50

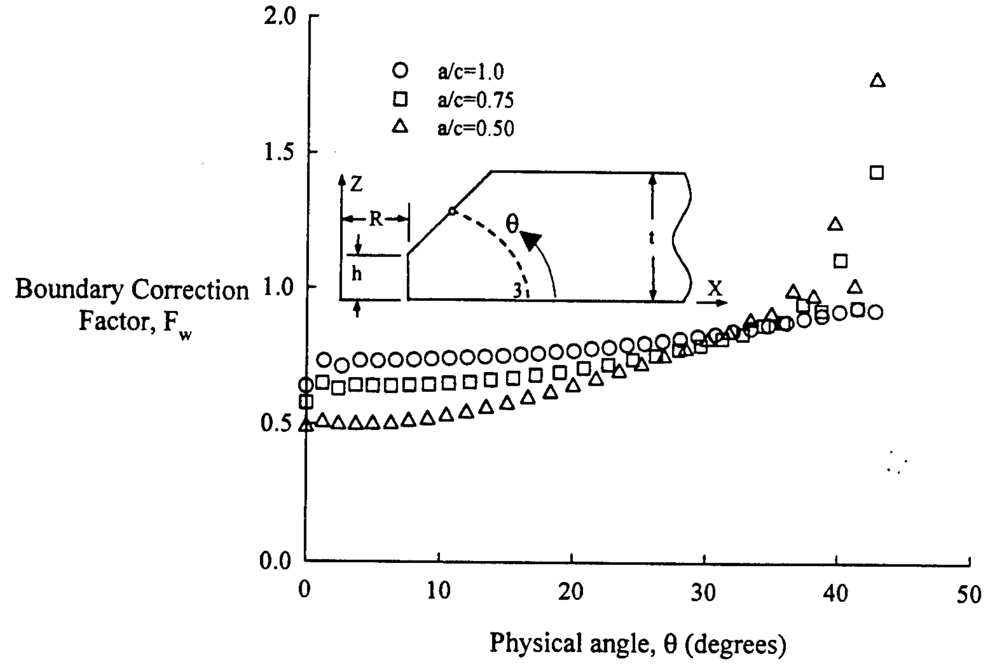

FIGURE 35. BOUNDARY CORRECTION FACTORS, F_w, FOR CRACK LOCATION 3 UNDER WEDGE LOADING, h/t = 0.05

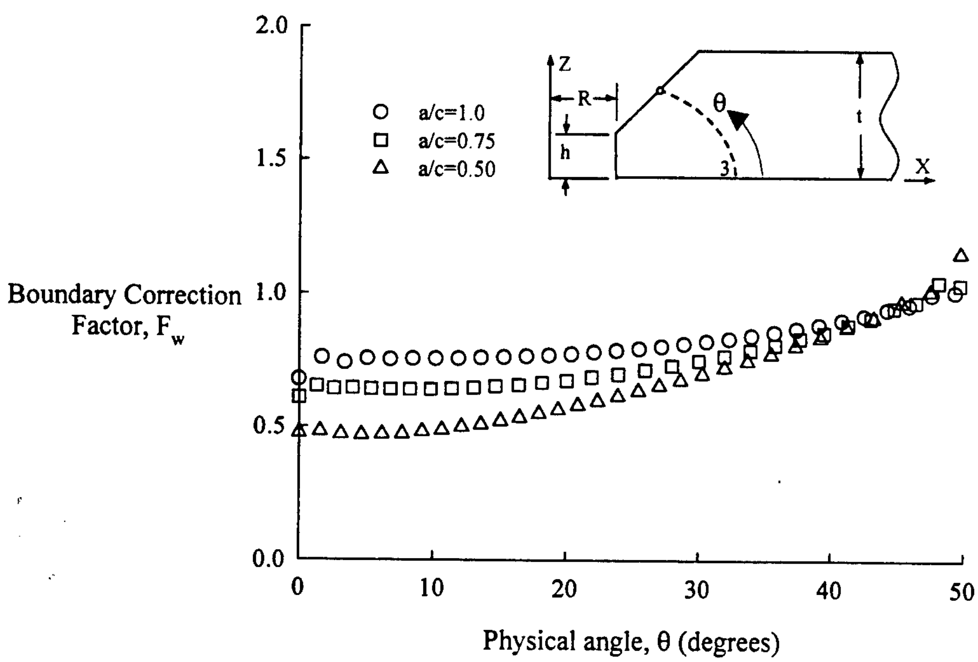

FIGURE 36. BOUNDARY CORRECTION FACTORS, F_w, FOR CRACK LOCATION 3 UNDER WEDGE LOADING, h/t = 0.25

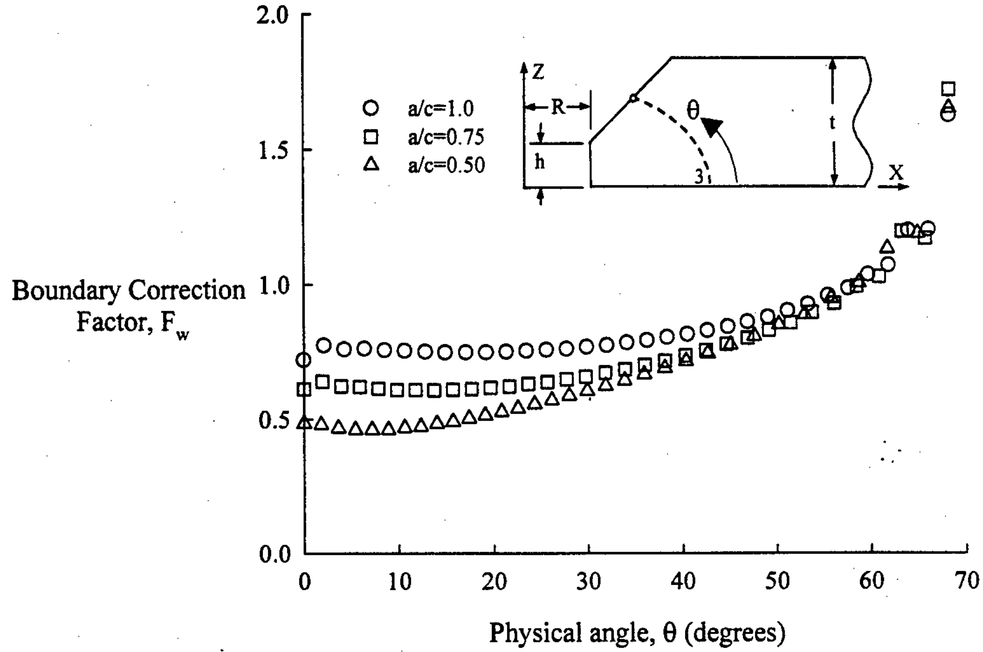

FIGURE 37. BOUNDARY CORRECTION FACTORS, F_w, FOR CRACK LOCATION 3 UNDER WEDGE LOADING, h/t = 0.50

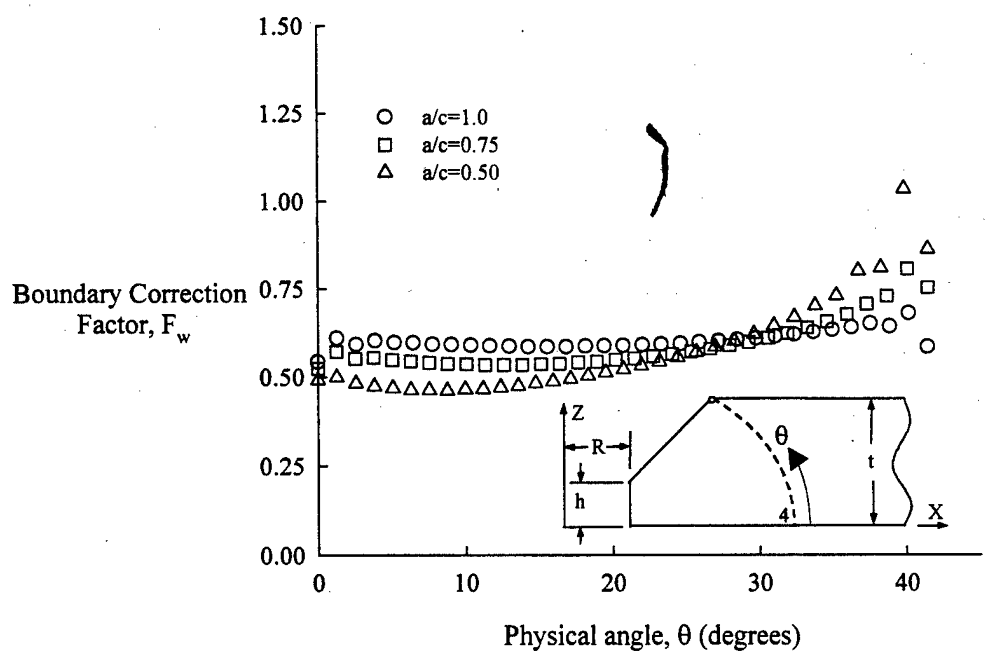

FIGURE 38. BOUNDARY CORRECTION FACTORS, F_w, FOR CRACK LOCATION 4 UNDER WEDGE LOADING, h/t = 0.05

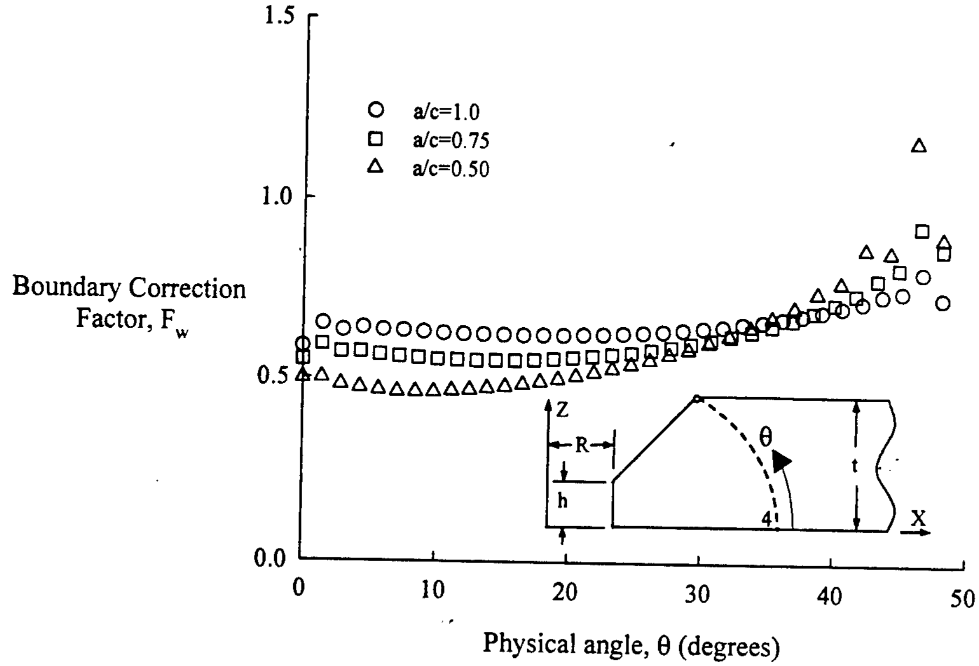

FIGURE 39. BOUNDARY CORRECTION FACTORS, F_w, FOR CRACK LOCATION 4 UNDER WEDGE LOADING, h/t = 0.25

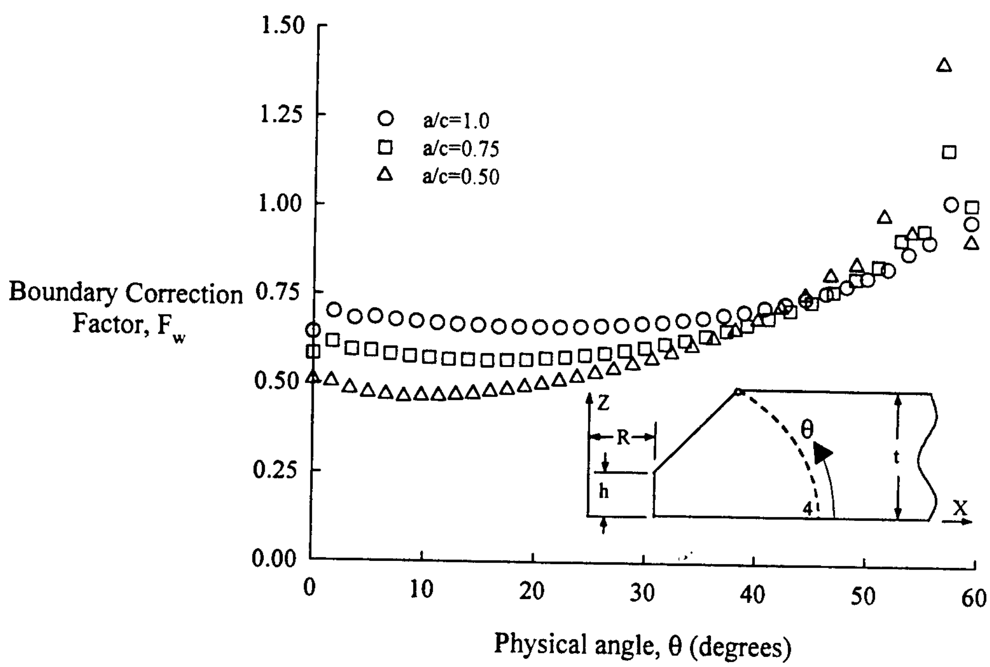

FIGURE 40. BOUNDARY CORRECTION FACTORS, F_w, FOR CRACK LOCATION 4 UNDER WEDGE LOADING, h/t = 0.50

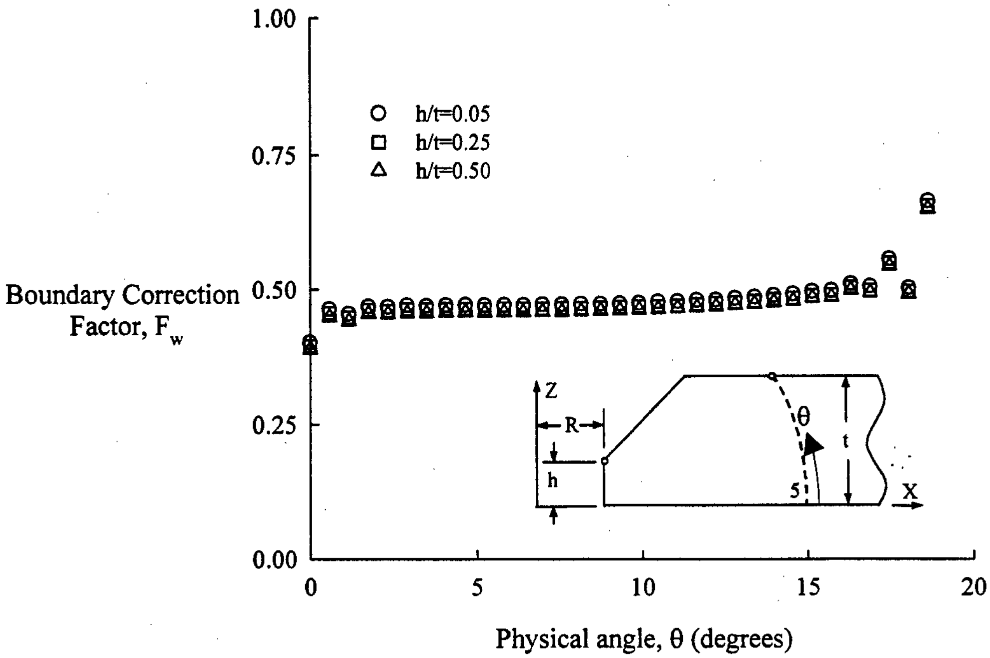

FIGURE 41. BOUNDARY CORRECTION FACTORS, F_t, FOR CRACK LOCATION 5 UNDER WEDGE LOADING, h/t = 0.05, 0.25, 0.50; AND a/c = 1.0

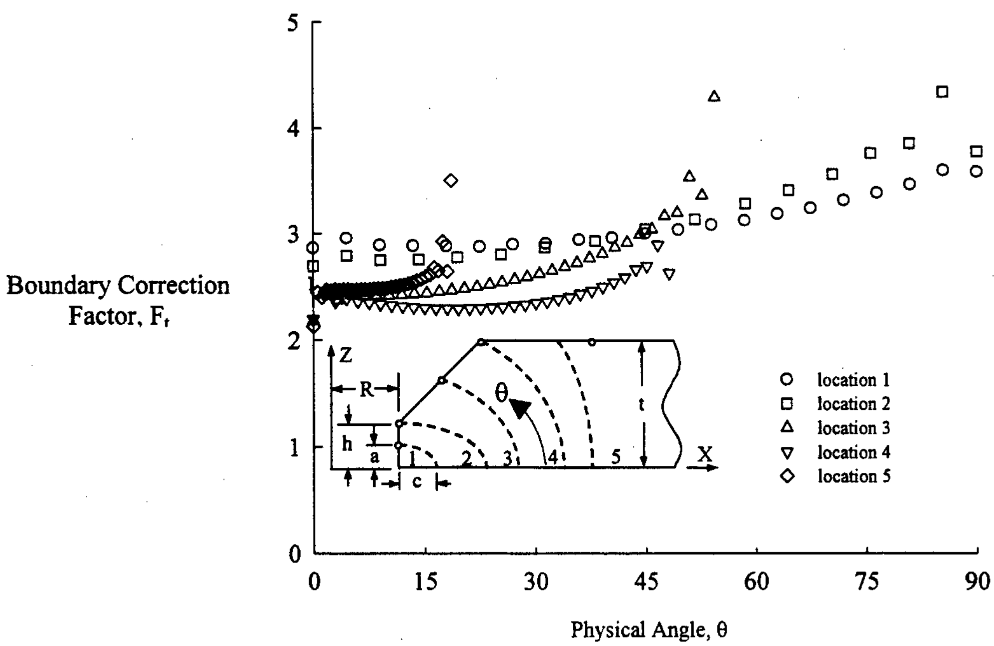

FIGURE 42. EFFECT OF CRACK LOCATION ON BOUNDARY CORRECTION FACTOR FOR h/t = 0.25 AND a/c = 1.0

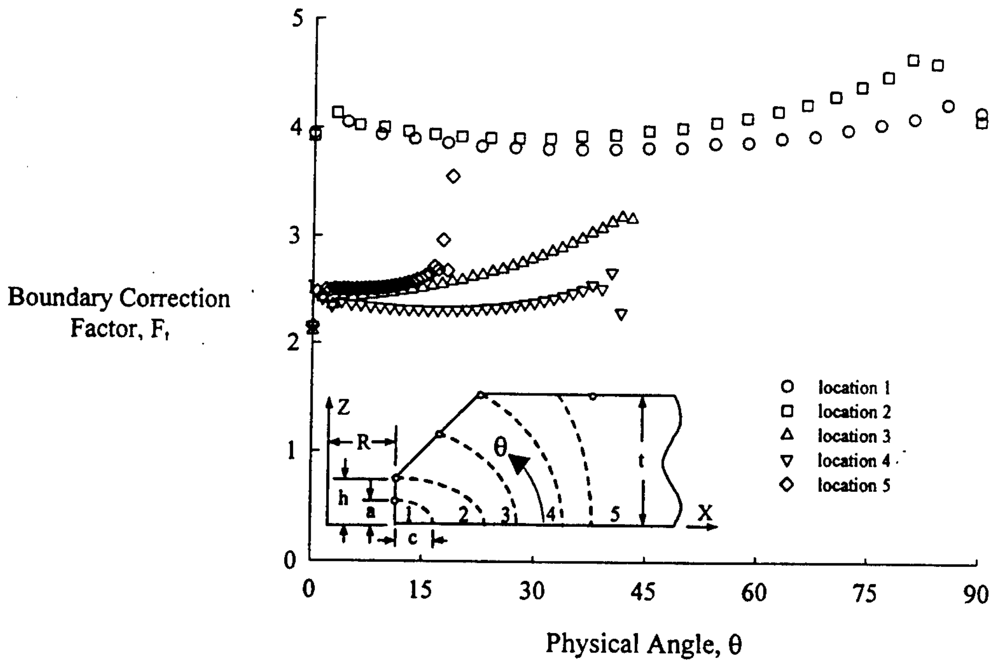

FIGURE 43. EFFECT OF CRACK LOCATION ON BOUNDARY CORRECTION FACTOR FOR h/t = 0.05 AND a/c =1.0

TABLE 1. ANALYSIS MATRIX

h/t	0.05, 0.25, and 0.5
a/c	1.0, 0.75, and 0.5
Locations	1, 2, 3, 4, and 5
Loading Conditions	Tension, Bending, and Wedge Load

TABLE 2. BOUNDARY CORRECTION FACTORS, F_t, FOR CRACK AT LOCATION 1 IN A COUNTERSUNK RIVET HOLE IN A PLATE UNDER TENSION FOR h/t = 0.05

$$(F_t = \frac{K_I}{S_t\sqrt{\pi a/Q}})$$

a/c = 1.0		a/c = 0.75		a/c = 0.50	
θ (deg)	F_t	θ (deg)	F_t	θ (deg)	F_t
0.0000	3.9488	0.0000	3.5391	0.0000	2.9745
4.5020	4.0505	3.9590	3.5133	3.4580	2.8230
9.0010	3.9361	7.9220	3.4449	6.8550	2.8792
13.5000	3.8970	11.8900	3.4145	10.1700	2.9050
18.0000	3.8583	15.8800	3.4125	13.4200	3.0170
22.5000	3.8287	19.8900	3.4254	16.6500	3.1021
27.0000	3.8170	23.9400	3.4681	19.9000	3.2174
31.4900	3.8052	28.0400	3.4881	23.2200	3.2989
35.9900	3.8016	32.2000	3.5387	26.6600	3.4027
40.5000	3.8093	36.4500	3.5822	30.2700	3.4811
45.0000	3.8210	40.7900	3.6363	34.0800	3.5673
49.4900	3.8237	45.2300	3.6805	38.1300	3.6385
54.0100	3.8654	49.7900	3.7418	42.5000	3.7177
58.5000	3.8730	54.4600	3.7900	47.1800	3.7790
63.0000	3.9155	59.2500	3.8516	52.2400	3.8460
67.4900	3.9401	64.1600	3.9016	57.6800	3.9074
71.9900	3.9978	69.1800	3.9675	63.5300	3.9658
76.4900	4.0514	74.2900	4.0323	69.7500	4.0320
81.0000	4.1105	79.4800	4.0752	76.3000	4.0553
85.5000	4.2418	84.7300	4.2075	83.0800	4.1570
90.0000	4.1692	90.0000	4.0512	90.0000	3.9398

TABLE 3. BOUNDARY CORRECTION FACTORS, F_t, FOR CRACK AT LOCATION 1 IN A COUNTERSUNK RIVET HOLE IN A PLATE UNDER TENSION FOR h/t = 0.25

$$(F_t = \frac{K_I}{S_t\sqrt{\pi a/Q}})$$

a/c = 1.0		a/c = 0.75		a/c = 0.50	
θ (deg)	F_t	θ (deg)	F_t	θ (deg)	F_t
0.0000	2.8621	0.0000	2.4000	0.0000	1.8869
4.5000	2.9557	2.4740	2.4960	2.1659	1.8655
8.9990	2.8896	4.9480	2.4370	4.3147	1.8608
13.5000	2.8813	7.4250	2.4360	6.4345	1.8676
18.0000	2.8801	9.9040	2.4330	8.5205	1.9116
22.5000	2.8741	12.3900	2.4330	10.5760	1.9482
27.0000	2.8956	14.8800	2.4500	12.6080	2.0087
31.4900	2.9027	17.3800	2.4620	14.6270	2.0576
36.0000	2.9393	19.8900	2.4930	16.6440	2.1263
40.4900	2.9580	22.4100	2.5110	18.6700	2.1779
44.9900	3.0008	24.9600	2.5510	20.7180	2.2464
49.4900	3.0340	27.5200	2.5770	22.7980	2.3007
53.9900	3.0836	30.1100	2.6180	24.9220	2.3654
58.4900	3.1258	32.7300	2.6520	27.1010	2.4228
62.9900	3.1869	35.3800	2.6970	29.3450	2.4827
67.4900	3.2395	38.0600	2.7320	31.6660	2.5410
71.9900	3.3152	40.7900	2.7800	34.0740	2.5997
76.4900	3.3872	43.5500	2.8180	36.5800	2.6557
80.9900	3.4657	46.3600	2.8680	39.1960	2.7143
85.4900	3.5994	49.2100	2.9060	41.9290	2.7689
90.0000	3.5870	52.1100	2.9580	44.7930	2.8261
		55.0500	2.9980	47.7930	2.8801
		58.0400	3.0490	50.9390	2.9360
		61.0800	3.0950	54.2350	2.9901
		64.1600	3.1430	57.6880	3.0451
		67.2900	3.1940	61.2950	3.0996
		70.4500	3.2470	65.0510	3.1539
		73.6500	3.2990	68.9550	3.2098
		76.8800	3.3550	72.9860	3.2614
		80.1400	3.4190	77.1320	3.3244
		83.4100	3.4410	81.3690	3.3394
		86.7000	3.5580	85.6690	3.4395
		90.0000	3.3660	90.0000	3.2271

TABLE 4. BOUNDARY CORRECTION FACTORS, F_t, FOR CRACK AT LOCATION 1 IN A COUNTERSUNK RIVET HOLE IN A PLATE UNDER TENSION FOR h/t = 0.50

$$(F_t = \frac{K_I}{S_t\sqrt{\pi a/Q}})$$

a/c = 1.0		a/c = 0.75		a/c = 0.50	
θ (deg)	F_t	θ (deg)	F_t	θ (deg)	F_t
0	2.3785	0	2.0192	0	1.5611
2.8110	2.5472	2.4740	2.0984	2.1660	1.5426
5.6220	2.4814	4.9480	2.0526	4.3147	1.5382
8.4330	2.4918	7.4250	2.0507	6.4343	1.5410
11.2400	2.4800	9.9050	2.0507	8.5205	1.5793
14.0500	2.4682	12.3900	2.0487	10.5760	1.6061
16.8700	2.4682	14.8800	2.0656	12.6080	1.6587
19.6800	2.4675	17.3800	2.0779	14.6270	1.6993
22.4900	2.4737	19.8900	2.1035	16.6430	1.7547
25.3000	2.4793	22.4100	2.1243	18.6700	1.8023
28.1100	2.4932	24.9600	2.1580	20.7180	1.8590
30.9200	2.5028	27.5200	2.1857	22.7980	1.9093
33.7300	2.5227	30.1100	2.2233	24.9220	1.9659
36.5400	2.5377	32.7300	2.2585	27.1010	2.0183
39.3500	2.5607	35.3800	2.2996	29.3460	2.0752
42.1700	2.5822	38.0600	2.3382	31.6660	2.1282
44.9800	2.6094	40.7900	2.3841	34.0750	2.1857
47.7900	2.6344	43.5500	2.4252	36.5810	2.2400
50.6000	2.6669	46.3600	2.4727	39.1960	2.2980
53.4100	2.6945	49.2100	2.5187	41.9290	2.3538
56.2200	2.7333	52.1000	2.5687	44.7920	2.4130
59.0300	2.7665	55.0500	2.6171	47.7920	2.4704
61.8400	2.8079	58.0400	2.6717	50.9370	2.5309
64.6500	2.8464	61.0800	2.7218	54.2350	2.5907
67.4600	2.8950	64.1600	2.7806	57.6860	2.6533
70.2700	2.9393	67.2800	2.8348	61.2930	2.7157
73.0800	2.9945	70.4500	2.8964	65.0510	2.7807
75.9000	3.0476	73.6500	2.9572	68.9550	2.8468
78.7100	3.1119	76.8800	3.0216	72.9880	2.9129
81.5200	3.1799	80.1400	3.0950	77.1350	2.9877
84.3300	3.2315	83.4100	3.1357	81.3710	3.0264
87.1600	3.3499	86.7000	3.2529	85.6690	3.1359
90.0000	3.2517	90.0000	3.1152	90.0000	2.9852

TABLE 5. BOUNDARY CORRECTION FACTORS, F_t, FOR CRACK AT LOCATION 2 IN A COUNTERSUNK RIVET HOLE IN A PLATE UNDER TENSION FOR h/t = 0.05

$$(F_t = \frac{K_I}{S_t\sqrt{\pi a/Q}})$$

a/c = 1.0		a/c = 0.75		a/c = 0.50	
θ (deg)	F_t	θ (deg)	F_t	θ (deg)	F_t
0.0000	3.9247	0.0000	3.4821	0.0000	2.8749
3.0324	4.1345	2.6674	3.5813	2.3349	2.8122
6.0652	4.0243	5.3356	3.4874	4.6489	2.8063
9.3534	4.0037	8.2326	3.4671	7.1183	2.8048
12.6430	3.9692	11.1350	3.4622	9.5421	2.8767
16.2110	3.9419	14.2880	3.4394	12.1300	2.9366
19.7770	3.9196	17.4580	3.4724	14.6910	3.0423
23.6460	3.9098	20.9150	3.4826	17.4660	3.1233
27.5100	3.9072	24.4040	3.5334	20.2690	3.2355
31.7060	3.9069	28.2290	3.5698	23.3750	3.3346
35.9030	3.9309	32.1110	3.6311	26.5840	3.4463
40.4500	3.9413	36.4030	3.6929	30.2230	3.5488
44.9960	3.9788	40.7850	3.7677	34.0760	3.6616
49.5490	4.0087	45.2790	3.8391	38.1840	3.7608
54.0980	4.0619	49.8860	3.9248	42.5920	3.8643
58.2920	4.1050	54.2420	3.9965	46.9570	3.9543
62.4840	4.1705	58.7000	4.0854	51.6450	4.0472
66.3580	4.2360	62.8970	4.1642	56.2660	4.1348
70.2210	4.3130	67.1840	4.2558	61.1750	4.2198
73.7880	4.4049	71.2030	4.3551	65.9580	4.3157
77.3610	4.4990	75.2780	4.4439	70.9750	4.3849
80.6420	4.6679	79.0770	4.6062	75.7690	4.5325
83.9380	4.6221	82.9010	4.5625	80.7010	4.4780
86.9620	5.1660	86.4480	5.0466	85.3310	4.8979
90.0000	4.0974	90.0000	4.0388	90.0000	3.9504

TABLE 6. BOUNDARY CORRECTION FACTORS, F_t, FOR CRACK AT LOCATION 2 IN A COUNTERSUNK RIVET HOLE IN A PLATE UNDER TENSION FOR h/t = 0.25

$$(F_t = \frac{K_I}{S_t\sqrt{\pi a/Q}})$$

a/c = 1.0		a/c = 0.75		a/c = 0.50	
θ (deg)	F_t	θ (deg)	F_t	θ (deg)	F_t
0.0000	2.6905	0.0000	2.2046	0.0000	1.7057
4.5381	2.7905	2.0021	2.3389	1.7538	1.7158
9.0766	2.7471	4.0046	2.2853	3.4983	1.7033
14.2720	2.7546	6.1277	2.2922	5.3284	1.7039
19.4670	2.7751	8.2524	2.2912	7.1346	1.7372
25.4140	2.8001	10.5070	2.2896	9.0220	1.7635
31.3600	2.8660	12.7650	2.3083	10.8850	1.8176
38.1680	2.9275	15.1650	2.3219	12.8390	1.8645
44.9760	3.0393	17.5720	2.3531	14.7830	1.9303
51.7830	3.1360	20.1360	2.3816	16.8410	1.9902
58.5900	3.2826	22.7140	2.4241	18.9110	2.0634
64.5380	3.4104	25.4680	2.4653	21.1290	2.1322
70.4840	3.5641	28.2470	2.5209	23.3890	2.2120
75.6790	3.7631	31.2250	2.5723	25.8430	2.2884
80.8740	3.8552	34.2420	2.6398	28.3760	2.3740
85.4370	4.3411	37.4870	2.7021	31.1620	2.4582
90.0000	3.7770	40.7880	2.7799	34.0750	2.5503
		44.1480	2.8507	37.1310	2.6381
		47.5720	2.9343	40.3510	2.7325
		50.8650	3.0083	43.5550	2.8193
		54.2200	3.0941	46.9360	2.9116
		57.4410	3.1710	50.2990	2.9986
		60.7170	3.2594	53.8380	3.0906
		63.8580	3.3402	57.3430	3.1784
		67.0420	3.4336	61.0080	3.2720
		70.0860	3.5216	64.6140	3.3630
		73.1630	3.6204	68.3550	3.4591
		76.0930	3.7222	71.9980	3.5620
		79.0470	3.8232	75.7380	3.6517
		81.8520	3.9773	79.3420	3.7999
		84.6670	3.9537	83.0040	3.7893
		87.3330	4.3697	86.4940	4.1584
		90.0000	3.5424	90.0000	3.4246

TABLE 7. BOUNDARY CORRECTION FACTORS, F_t, FOR CRACK AT LOCATION 2 IN A COUNTERSUNK RIVET HOLE IN A PLATE UNDER TENSION FOR h/t = 0.50

$$(F_t = \frac{K_I}{S_t\sqrt{\pi a/Q}})$$

a/c = 1.0		a/c = 0.75		a/c = 0.50	
θ (deg)	F_t	θ (deg)	F_t	θ (deg)	F_t
0.0000	2.3383	0.0000	1.9690	0.0000	1.6080
4.5366	2.4177	2.0021	2.0804	1.7539	1.6068
9.0733	2.3681	4.0046	2.0237	3.4983	1.5805
14.2660	2.3611	6.1277	2.0218	5.3284	1.5701
19.4600	2.3681	8.2524	2.0102	7.1346	1.5857
25.4040	2.3766	10.5070	2.0023	9.0220	1.5968
31.3490	2.4236	12.7650	2.0063	10.8850	1.6325
38.1540	2.4674	15.1650	2.0103	12.8400	1.6600
44.9590	2.5621	17.5720	2.0284	14.7830	1.7060
51.7640	2.6475	20.1350	2.0427	16.8410	1.7448
58.5690	2.7878	22.7140	2.0733	18.9110	1.7968
64.5130	2.9136	25.4680	2.0984	21.1300	1.8448
70.4580	3.0741	28.2470	2.1400	23.3890	1.9023
75.6510	3.2751	31.2250	2.1770	25.8440	1.9583
80.8440	3.3916	34.2420	2.2291	28.3760	2.0223
85.4220	3.8539	37.4870	2.2792	31.1630	2.0871
90.0000	3.4238	40.7870	2.3432	34.0750	2.1598
		44.1470	2.4034	37.1310	2.2307
		47.5720	2.4775	40.3510	2.3105
		50.8650	2.5440	43.5550	2.3847
		54.2190	2.6245	46.9360	2.4682
		57.4410	2.6977	50.2990	2.5469
		60.7170	2.7848	53.8380	2.6354
		63.8570	2.8649	57.3420	2.7196
		67.0420	2.9610	61.0080	2.8146
		70.0860	3.0505	64.6150	2.9072
		73.1630	3.1557	68.3540	3.0097
		76.0940	3.2608	71.9980	3.1167
		79.0470	3.3730	75.7380	3.2212
		81.8510	3.5235	79.3420	3.3706
		84.6670	3.5533	83.0020	3.4093
		87.3310	3.9055	86.4930	3.7332
		90.0000	3.2959	90.0000	3.2053

TABLE 8. BOUNDARY CORRECTION FACTORS, F_t, FOR CRACK AT LOCATION 3 IN A COUNTERSUNK RIVET HOLE IN A PLATE UNDER TENSION FOR h/t = 0.05

$$(F_t = \frac{K_I}{S_t\sqrt{\pi a/Q}})$$

a/c = 1.0		a/c = 0.75		a/c = 0.50	
θ (deg)	F_t	θ (deg)	F_t	θ (deg)	F_t
0.0000	2.1081	0.0000	1.9806	0.0000	1.8077
1.3389	2.4180	1.1970	2.2212	1.2105	1.8712
2.6778	2.3532	2.3940	2.1527	2.4179	1.8359
4.0166	2.4258	3.6750	2.1941	3.7030	1.8295
5.3555	2.4231	4.9563	2.1911	4.9784	1.8391
6.6943	2.4381	6.3277	2.1924	6.3305	1.8433
8.0332	2.4473	7.6998	2.2025	7.6688	1.8710
9.3721	2.4599	9.1690	2.2098	9.0859	1.8947
10.7110	2.4713	10.6400	2.2296	10.4890	1.9373
12.0500	2.4853	12.2150	2.2442	11.9780	1.9753
13.3890	2.4996	13.7930	2.2740	13.4590	2.0311
14.7280	2.5170	15.4850	2.2980	15.0380	2.0822
16.0660	2.5354	17.1810	2.3386	16.6170	2.1491
17.4050	2.5521	19.0010	2.3732	18.3130	2.2137
18.7440	2.5767	20.8290	2.4263	20.0220	2.2934
20.0830	2.5933	22.6650	2.4710	21.7520	2.3668
21.4220	2.6229	24.5100	2.5331	23.5090	2.4565
22.7610	2.6409	26.2450	2.5852	25.1810	2.5352
24.1000	2.6735	27.9900	2.6564	26.8870	2.6309
25.4380	2.6952	29.6320	2.7123	28.5170	2.7154
26.7770	2.7286	31.2850	2.7966	30.1860	2.8260
28.1160	2.7561	32.8410	2.8554	31.7850	2.9124
29.4550	2.7931	34.4080	2.9701	33.4250	3.0628
30.7940	2.8229	35.8840	3.0108	34.9990	3.1347
32.1330	2.8653	37.3700	3.2400	36.6130	3.4280
33.4720	2.8990	38.7690	3.1584	38.1630	3.3561
34.8110	2.9457	40.1790	3.8069	39.7530	4.2799
36.1500	2.9855	41.5060	3.1976	41.2780	3.4798
37.4880	3.0414	42.8440	4.9477	42.8440	6.1040
38.8270	3.0827				
40.1660	3.1412				
41.5050	3.1887				
42.8440	3.1722				

TABLE 9. BOUNDARY CORRECTION FACTORS, F_t, FOR CRACK AT LOCATION 3 IN A COUNTERSUNK RIVET HOLE IN A PLATE UNDER TENSION FOR h/t = 0.25

$$(F_t = \frac{K_I}{S_t\sqrt{\pi a/Q}})$$

a/c = 1.0		a/c = 0.75		a/c = 0.50	
θ (deg)	F_t	θ (deg)	F_t	θ (deg)	F_t
0.0000	2.1801	0.0000	2.0649	0.0000	1.8001
1.7011	2.4338	1.2997	2.2022	1.5617	1.8158
3.4021	2.3747	2.5995	2.1715	3.1166	1.7734
5.1031	2.4197	3.9773	2.1759	4.6594	1.7637
6.8042	2.4121	5.3555	2.1640	6.1863	1.7678
8.5052	2.4179	6.8165	2.1556	7.6958	1.7712
10.2060	2.4182	8.2784	2.1552	9.1882	1.7951
11.9070	2.4246	9.8289	2.1526	10.6660	1.8127
13.6080	2.4327	11.3810	2.1608	12.1310	1.8466
15.3090	2.4399	13.0280	2.1655	13.5880	1.8735
17.0100	2.4523	14.6790	2.1827	15.0410	1.9134
18.7120	2.4652	16.4310	2.1954	16.4940	1.9467
20.4120	2.4801	18.1890	2.2214	17.9520	1.9905
22.1140	2.4975	20.0590	2.2438	19.4190	2.0294
23.8150	2.5188	21.9370	2.2785	20.8990	2.0765
25.5150	2.5380	23.9370	2.3117	22.3970	2.1207
27.2160	2.5639	25.9500	2.3572	23.9160	2.1716
28.9180	2.5894	27.9760	2.4003	25.4610	2.2212
30.6190	2.6197	30.0180	2.4548	27.0350	2.2770
32.3200	2.6493	31.9620	2.5056	28.6440	2.3322
34.0210	2.6873	33.9230	2.5674	30.2910	2.3954
35.7220	2.7215	35.7900	2.6253	31.9790	2.4574
37.4230	2.7673	37.6750	2.6981	33.7140	2.5298
39.1240	2.8076	39.4700	2.7613	35.4990	2.6015
40.8250	2.8654	41.2830	2.8507	37.3380	2.6870
42.5260	2.9123	43.0100	2.9191	39.2350	2.7723
44.2270	2.9887	44.7540	3.0423	41.1930	2.8846
45.9280	3.0412	46.4160	3.1051	43.2180	2.9833
47.6290	3.1674	48.0930	3.3378	45.3110	3.1548
49.3300	3.1965	49.6900	3.3047	47.4760	3.2784
51.0310	3.5344	51.3020	4.0128	49.7170	3.7164
52.7320	3.3603	52.8610	3.4543	52.0360	3.7292
54.4330	4.2879	54.4330	5.4494	54.4330	5.2819

TABLE 10. BOUNDARY CORRECTION FACTORS, F_t, FOR CRACK AT LOCATION 3 IN A COUNTERSUNK RIVET HOLE IN A PLATE UNDER TENSION FOR h/t = 0.50

$$(F_t = \frac{K_I}{S_t\sqrt{\pi a/Q}})$$

a/c = 1.0		a/c = 0.75		a/c = 0.50	
θ (deg)	F_t	θ (deg)	F_t	θ (deg)	F_t
0.0000	2.3046	0.0000	2.0985	0.0000	1.9100
2.1355	2.4665	1.9583	2.1904	1.8165	1.8879
4.2709	2.4182	3.9171	2.1269	3.6225	1.8334
6.4064	2.4238	5.8765	2.1149	5.4103	1.8087
8.5419	2.4025	7.8373	2.0903	7.1752	1.8055
10.6770	2.3890	9.8005	2.0715	8.9166	1.7999
12.8130	2.3786	11.7670	2.0642	10.6370	1.8175
14.9480	2.3694	13.7360	2.0544	12.3410	1.8272
17.0840	2.3656	15.7110	2.0569	14.0350	1.8534
19.2190	2.3623	17.6910	2.0570	15.7250	1.8720
21.3540	2.3637	19.6790	2.0673	17.4180	1.9021
23.4900	2.3667	21.6760	2.0756	19.1220	1.9269
25.6260	2.3745	23.6830	2.0929	20.8420	1.9596
27.7610	2.3822	25.7030	2.1084	22.5850	1.9888
29.8960	2.3964	27.7370	2.1326	24.3580	2.0244
32.0320	2.4095	29.7870	2.1545	26.1680	2.0578
34.1670	2.4301	31.8540	2.1856	28.0200	2.0968
36.3030	2.4500	33.9400	2.2148	29.9220	2.1350
38.4380	2.4766	36.0470	2.2526	31.8800	2.1793
40.5740	2.5047	38.1760	2.2899	33.8990	2.2234
42.7090	2.5395	40.3300	2.3363	35.9870	2.2748
44.8450	2.5763	42.5090	2.3831	38.1500	2.3271
46.9800	2.6223	44.7130	2.4409	40.3930	2.3890
49.1150	2.6699	46.9460	2.4989	42.7230	2.4525
51.2510	2.7308	49.2070	2.5731	45.1450	2.5299
53.3870	2.7930	51.4970	2.6458	47.6650	2.6097
55.5220	2.8814	53.8160	2.7514	50.2870	2.7143
57.6570	2.9584	56.1650	2.8375	53.0140	2.8138
59.7930	3.1024	58.5420	3.0117	55.8490	2.9677
61.9280	3.1985	60.9500	3.1089	58.7950	3.1172
64.0640	3.5699	63.3850	3.5913	61.8490	3.4710
66.1990	3.5762	65.8470	3.5044	65.0400	3.6196
68.3340	4.8215	68.3340	5.1237	68.3340	4.9767

TABLE 11. BOUNDARY CORRECTION FACTORS, F_t, FOR CRACK AT LOCATION 4 IN A COUNTERSUNK RIVET HOLE IN A PLATE UNDER TENSION FOR h/t = 0.05

$$(F_t = \frac{K_I}{S_t\sqrt{\pi a/Q}})$$

a/c = 1.0		a/c = 0.75		a/c = 0.50	
θ (deg)	F_t	θ (deg)	F_t	θ (deg)	F_t
0.0000	2.1551	0.0000	2.1871	0.0000	2.2831
1.2954	2.4107	1.2556	2.3759	1.2755	2.3140
2.5909	2.3420	2.5112	2.2948	2.5473	2.2302
3.8863	2.3796	3.7672	2.3044	3.8122	2.1955
5.1817	2.3591	5.0234	2.2764	5.0675	2.1669
6.4770	2.3528	6.2801	2.2571	6.3118	2.1405
7.7724	2.3399	7.5374	2.2409	7.5444	2.1343
9.0679	2.3324	8.7955	2.2257	8.7656	2.1238
10.3630	2.3245	10.0550	2.2173	9.9763	2.1300
11.6590	2.3171	11.3150	2.2081	11.1780	2.1310
12.9540	2.3133	12.5770	2.2054	12.3730	2.1443
14.2490	2.3088	13.8400	2.2022	13.5620	2.1537
15.5450	2.3074	15.1050	2.2049	14.7490	2.1719
16.8400	2.3065	16.3730	2.2068	15.9350	2.1874
18.1360	2.3076	17.6440	2.2153	17.1230	2.2095
19.4310	2.3096	18.9170	2.2212	18.3160	2.2306
20.7260	2.3137	20.1940	2.2355	19.5150	2.2571
22.0220	2.3185	21.4750	2.2464	20.7230	2.2830
23.3170	2.3263	22.7600	2.2656	21.9420	2.3151
24.6130	2.3336	24.0500	2.2828	23.1750	2.3470
25.9080	2.3450	25.3450	2.3072	24.4240	2.3861
27.2030	2.3552	26.6460	2.3314	25.6910	2.4266
28.4990	2.3714	27.9530	2.3633	26.9790	2.4760
29.7940	2.3847	29.2660	2.3954	28.2890	2.5289
31.0900	2.4057	30.5860	2.4375	29.6230	2.5930
32.3850	2.4242	31.9140	2.4813	30.9850	2.6677
33.6810	2.4486	33.2490	2.5381	32.3750	2.7510
34.9760	2.4753	34.5930	2.5986	33.7970	2.8686
36.2710	2.5034	35.9460	2.6778	35.2520	2.9606
37.5670	2.5501	37.3080	2.7876	36.7440	3.2289
38.8620	2.5198	38.6800	2.8709	38.2730	3.2434
40.1580	2.6717	40.0610	3.1759	39.8420	4.1197
41.4530	2.2949	41.4530	2.9491	41.4530	3.3984

TABLE 12. BOUNDARY CORRECTION FACTORS, F_t, FOR CRACK AT LOCATION 4 IN A COUNTERSUNK RIVET HOLE IN A PLATE UNDER TENSION FOR h/t = 0.25

$$(F_t = \frac{K_I}{S_t\sqrt{\pi a/Q}})$$

a/c = 1.0		a/c = 0.75		a/c = 0.50	
θ (deg)	F_t	θ (deg)	F_t	θ (deg)	F_t
0.0000	2.1935	0.0000	2.1902	0.0000	2.2465
1.5066	2.4218	1.4418	2.3477	1.4316	2.2511
3.0131	2.3553	2.8837	2.2667	2.8579	2.1681
4.5196	2.3815	4.3261	2.2662	4.2747	2.1289
6.0262	2.3586	5.7689	2.2343	5.6786	2.1015
7.5326	2.3472	7.2125	2.2121	7.0681	2.0754
9.0392	2.3332	8.6570	2.1938	8.4429	2.0715
10.5460	2.3217	10.1030	2.1771	9.8043	2.0626
12.0520	2.3126	11.5500	2.1682	11.1540	2.0700
13.5590	2.3039	13.0000	2.1578	12.4950	2.0726
15.0650	2.2993	14.4510	2.1559	13.8290	2.0863
16.5720	2.2937	15.9060	2.1522	15.1610	2.0963
18.0780	2.2929	17.3640	2.1558	16.4930	2.1144
19.5850	2.2905	18.8260	2.1584	17.8290	2.1300
21.0920	2.2939	20.2920	2.1676	19.1720	2.1515
22.5980	2.2952	21.7640	2.1762	20.5260	2.1721
24.1050	2.3019	23.2410	2.1903	21.8930	2.1976
25.6110	2.3076	24.7250	2.2051	23.2780	2.2231
27.1180	2.3186	26.2160	2.2256	24.6820	2.2541
28.6240	2.3276	27.7150	2.2462	26.1110	2.2861
30.1310	2.3439	29.2220	2.2738	27.5650	2.3245
31.6370	2.3573	30.7380	2.3022	29.0490	2.3655
33.1440	2.3798	32.2640	2.3385	30.5660	2.4153
34.6500	2.3991	33.8020	2.3767	32.1190	2.4698
36.1570	2.4280	35.3500	2.4258	33.7110	2.5358
37.6630	2.4569	36.9100	2.4785	35.3440	2.6159
39.1700	2.4938	38.4820	2.5449	37.0230	2.7008
40.6770	2.5363	40.0680	2.6224	38.7510	2.8328
42.1830	2.5860	41.6670	2.7124	40.5290	2.9174
43.6890	2.6581	43.2800	2.8615	42.3610	3.2371
45.1960	2.6908	44.9080	2.9604	44.2500	3.1865
46.7030	2.8894	46.5510	3.3851	46.1990	4.2824
48.2090	2.6256	48.2090	3.1286	48.2090	3.2651

TABLE 13. BOUNDARY CORRECTION FACTORS, F_t, FOR CRACK AT LOCATION 4 IN A COUNTERSUNK RIVET HOLE IN A PLATE UNDER TENSION FOR h/t = 0.50

$$(F_t = \frac{K_I}{S_t\sqrt{\pi a/Q}})$$

a/c = 1.0		a/c = 0.75		a/c = 0.50	
θ (deg)	F_t	θ (deg)	F_t	θ (deg)	F_t
0.0000	2.2620	0.0000	2.2188	0.0000	2.2316
1.8504	2.4533	1.7306	2.3349	1.6543	2.2046
3.7007	2.3855	3.4614	2.2526	3.3006	2.1211
5.5509	2.3953	5.1928	2.2369	4.9327	2.0762
7.4012	2.3669	6.9252	2.2014	6.5464	2.0513
9.2516	2.3482	8.6589	2.1726	8.1405	2.0256
11.1020	2.3301	10.3940	2.1528	9.7160	2.0250
12.9520	2.3130	12.1320	2.1331	11.2760	2.0169
14.8030	2.3019	13.8730	2.1229	12.8240	2.0267
16.6530	2.2893	15.6180	2.1119	14.3650	2.0294
18.5030	2.2826	17.3680	2.1098	15.9040	2.0440
20.3540	2.2756	19.1230	2.1064	17.4460	2.0541
22.2040	2.2740	20.8850	2.1111	18.9960	2.0719
24.0540	2.2708	22.6550	2.1144	20.5600	2.0867
25.9050	2.2750	24.4330	2.1258	22.1420	2.1078
27.7550	2.2761	26.2220	2.1353	23.7480	2.1270
29.6050	2.2854	28.0220	2.1527	25.3830	2.1518
31.4550	2.2922	29.8340	2.1691	27.0500	2.1761
33.3060	2.3061	31.6600	2.1936	28.7560	2.2067
35.1560	2.3196	33.5010	2.2175	30.5040	2.2379
37.0070	2.3403	35.3580	2.2501	32.3010	2.2771
38.8570	2.3612	37.2320	2.2838	34.1500	2.3191
40.7070	2.3908	39.1240	2.3279	36.0560	2.3714
42.5570	2.4206	41.0350	2.3740	38.0240	2.4303
44.4080	2.4624	42.9670	2.4341	40.0590	2.5008
46.2580	2.5069	44.9190	2.5016	42.1650	2.5924
48.1080	2.5651	46.8930	2.5825	44.3470	2.6821
49.9590	2.6343	48.8890	2.6887	46.6080	2.8425
51.8090	2.7131	50.9070	2.7892	48.9520	2.9151
53.6590	2.8459	52.9490	3.0204	51.3820	3.3344
55.5100	2.9399	55.0130	3.0891	53.9010	3.1584
57.3600	3.3071	57.1000	3.8159	56.5110	4.6715
59.2100	3.1100	59.2100	3.2786	59.2100	2.9994

TABLE 14. BOUNDARY CORRECTION FACTORS, F_t, FOR CRACK AT LOCATION 5 IN A COUNTERSUNK RIVET HOLE IN A PLATE UNDER TENSION FOR h/t = 0.05, 0.25, 0.5; AND a/c = 1.0

$$(F_t = \frac{K_I}{S_t\sqrt{\pi a/Q}})$$

h/t=0.05		h/t=0.25		h/t=0.5	
θ (deg)	F_t	θ (deg)	F_t	θ (deg)	F_t
0.0000	2.1530	0.0000	2.1268	0.0000	2.1046
0.5832	2.4769	0.5832	2.4461	0.5832	2.4200
1.1664	2.4281	1.1664	2.3976	1.1664	2.3718
1.7497	2.4975	1.7497	2.4659	1.7497	2.4390
2.3329	2.4894	2.3329	2.4575	2.3329	2.4306
2.9161	2.5015	2.9161	2.4693	2.9161	2.4420
3.4993	2.4995	3.4993	2.4671	3.4993	2.4397
4.0825	2.5016	4.0825	2.4689	4.0825	2.4414
4.6657	2.5030	4.6657	2.4701	4.6657	2.4424
5.2489	2.5012	5.2489	2.4681	5.2489	2.4403
5.8322	2.5037	5.8322	2.4704	5.8322	2.4425
6.4154	2.5032	6.4154	2.4697	6.4154	2.4417
6.9986	2.5047	6.9986	2.4711	6.9986	2.4429
7.5818	2.5063	7.5818	2.4725	7.5818	2.4441
8.1650	2.5093	8.1650	2.4753	8.1650	2.4468
8.7483	2.5124	8.7483	2.4781	8.7483	2.4495
9.3315	2.5160	9.3315	2.4816	9.3315	2.4528
9.9147	2.5208	9.9147	2.4861	9.9147	2.4572
10.4980	2.5275	10.4980	2.4926	10.4980	2.4636
11.0810	2.5333	11.0810	2.4981	11.0810	2.4689
11.6640	2.5421	11.6640	2.5067	11.6640	2.4773
12.2480	2.5504	12.2480	2.5147	12.2480	2.4851
12.8310	2.5630	12.8310	2.5269	12.8310	2.4971
13.4140	2.5735	13.4140	2.5372	13.4140	2.5071
13.9970	2.5914	13.9970	2.5546	13.9970	2.5243
14.5800	2.6047	14.5800	2.5676	14.5800	2.5370
15.1640	2.6338	15.1640	2.5962	15.1640	2.5651
15.7470	2.6444	15.7470	2.6064	15.7470	2.5752
16.3300	2.7178	16.3300	2.6787	16.3300	2.6465
16.9130	2.6875	16.9130	2.6487	16.9130	2.6168
17.4970	2.9669	17.4970	2.9240	17.4970	2.8888
18.0800	2.6804	18.0800	2.6415	18.0800	2.6096
18.6630	3.5562	18.6630	3.5048	18.6630	3.4626

TABLE 15. BOUNDARY CORRECTION FACTORS, F_b, FOR CRACK AT LOCATION 1 IN A COUNTERSUNK RIVET HOLE IN A PLATE UNDER BENDING FOR h/t = 0.05

$$(F_b = \frac{K_I}{S_b\sqrt{\pi a/Q}})$$

a/c = 1.0		a/c = 0.75		a/c = 0.50	
θ (deg)	F_b	θ (deg)	F_b	θ (deg)	F_b
0.0000	0.7102	0.0000	0.6326	0.0000	0.5238
4.5017	0.7326	3.9590	0.6317	3.4585	0.5005
9.0011	0.7154	7.9219	0.6227	6.8553	0.5141
13.4990	0.7120	11.8920	0.6209	10.1690	0.5228
17.9970	0.7088	15.8760	0.6243	13.4160	0.5470
22.4970	0.7071	19.8910	0.6305	16.6450	0.5664
26.9950	0.7088	23.9430	0.6421	19.8960	0.5912
31.4940	0.7105	28.0380	0.6494	23.2170	0.6099
35.9950	0.7136	32.2010	0.6624	26.6610	0.6326
40.5000	0.7187	36.4500	0.6739	30.2670	0.6505
44.9970	0.7244	40.7850	0.6873	34.0760	0.6698
49.4930	0.7282	45.2250	0.6988	38.1340	0.6861
54.0080	0.7393	49.7860	0.7131	42.4970	0.7038
58.5050	0.7436	54.4620	0.7250	47.1800	0.7181
62.9990	0.7543	59.2540	0.7391	52.2360	0.7332
67.4940	0.7615	64.1590	0.7509	57.6800	0.7472
71.9900	0.7747	69.1840	0.7655	63.5290	0.7604
76.4910	0.7869	74.2910	0.7798	69.7500	0.7752
81.0020	0.8001	79.4760	0.7898	76.2990	0.7817
85.5030	0.8269	84.7310	0.8169	83.0770	0.8033
90.0000	0.8152	90.0000	0.7895	90.0000	0.7652

TABLE 16. BOUNDARY CORRECTION FACTORS, F_b, FOR CRACK AT LOCATION 1 IN A COUNTERSUNK RIVET HOLE IN A PLATE UNDER BENDING FOR h/t = 0.25

$$(F_b = \frac{K_I}{S_b\sqrt{\pi a/Q}})$$

a/c = 1.0		a/c = 0.75		a/c = 0.50	
θ (deg)	F_b	θ (deg)	F_b	θ (deg)	F_b
0.0000	0.4242	0.0000	0.3368	0.0000	0.2297
4.4995	0.4566	2.4740	0.3620	2.1659	0.2370
8.9986	0.4616	4.9483	0.3622	4.3147	0.2455
13.4980	0.4767	7.4247	0.3717	6.4345	0.2566
17.9980	0.4932	9.9041	0.3810	8.5205	0.2731
22.4960	0.5088	12.3880	0.3909	10.5760	0.2888
26.9960	0.5293	14.8790	0.4040	12.6080	0.3084
31.4940	0.5473	17.3790	0.4160	14.6270	0.3263
35.9950	0.5703	19.8900	0.4314	16.6440	0.3476
40.4930	0.5899	22.4150	0.4446	18.6700	0.3660
44.9930	0.6132	24.9590	0.4616	20.7180	0.3875
49.4930	0.6345	27.5240	0.4762	22.7980	0.4064
53.9910	0.6579	30.1140	0.4934	24.9220	0.4272
58.4900	0.6796	32.7310	0.5089	27.1010	0.4467
62.9890	0.7040	35.3810	0.5266	29.3450	0.4665
67.4880	0.7259	38.0650	0.5424	31.6660	0.4860
71.9890	0.7516	40.7880	0.5603	34.0740	0.5054
76.4860	0.7757	43.5510	0.5761	36.5800	0.5243
80.9880	0.8009	46.3580	0.5941	39.1960	0.5435
85.4940	0.8369	49.2070	0.6095	41.9290	0.5618
90.0000	0.8440	52.1060	0.6275	44.7930	0.5805
		55.0490	0.6429	47.7930	0.5984
		58.0430	0.6601	50.9390	0.6165
		61.0800	0.6762	54.2350	0.6342
		64.1590	0.6924	57.6880	0.6518
		67.2870	0.7089	61.2950	0.6693
		70.4510	0.7257	65.0510	0.6865
		73.6480	0.7420	68.9550	0.7040
		76.8800	0.7589	72.9860	0.7206
		80.1370	0.7775	77.1320	0.7397
		83.4130	0.7878	81.3690	0.7492
		86.7050	0.8180	85.6690	0.7774
		90.0000	0.7843	90.0000	0.7423

TABLE 17. BOUNDARY CORRECTION FACTORS, F_b, FOR CRACK AT LOCATION 1 IN A COUNTERSUNK RIVET HOLE IN A PLATE UNDER BENDING FOR h/t = 0.50

$$(F_b = \frac{K_I}{S_b\sqrt{\pi a/Q}})$$

a/c = 1.0		a/c = 0.75		a/c = 0.50	
θ(deg)	F_b	θ(deg)	F_b	θ(deg)	F_b
0.0000	0.3103	0.0000	0.2368	0.0000	0.1365
2.8109	0.3540	2.4736	0.2641	2.1660	0.1494
5.6219	0.3594	4.9481	0.2720	4.3147	0.1625
8.4328	0.3770	7.4249	0.2868	6.4343	0.1776
11.2440	0.3911	9.9045	0.3019	8.5205	0.1974
14.0550	0.4054	12.3880	0.3170	10.5760	0.2160
16.8660	0.4218	14.8790	0.3353	12.6080	0.2387
19.6770	0.4382	17.3790	0.3529	14.6270	0.2597
22.4880	0.4560	19.8890	0.3731	16.6430	0.2834
25.2990	0.4735	22.4150	0.3923	18.6700	0.3059
28.1100	0.4927	24.9580	0.4141	20.7180	0.3301
30.9210	0.5110	27.5230	0.4345	22.7980	0.3532
33.7320	0.5312	30.1130	0.4569	24.9220	0.3777
36.5430	0.5504	32.7310	0.4787	27.1010	0.4012
39.3540	0.5709	35.3800	0.5015	29.3460	0.4258
42.1650	0.5909	38.0650	0.5237	31.6660	0.4495
44.9760	0.6119	40.7880	0.5473	34.0750	0.4741
47.7870	0.6323	43.5510	0.5697	36.5810	0.4980
50.5980	0.6538	46.3560	0.5931	39.1960	0.5227
53.4080	0.6741	49.2080	0.6161	41.9290	0.5468
56.2200	0.6963	52.1050	0.6396	44.7920	0.5715
59.0320	0.7171	55.0490	0.6626	47.7920	0.5958
61.8410	0.7391	58.0410	0.6866	50.9370	0.6206
64.6520	0.7602	61.0780	0.7093	54.2350	0.6452
67.4630	0.7831	64.1610	0.7337	57.6860	0.6703
70.2740	0.8046	67.2850	0.7567	61.2930	0.6953
73.0850	0.8281	70.4490	0.7812	65.0510	0.7208
75.8960	0.8507	73.6500	0.8051	68.9550	0.7465
78.7090	0.8757	76.8800	0.8299	72.9880	0.7722
81.5190	0.9011	80.1370	0.8567	77.1350	0.8003
84.3300	0.9233	83.4130	0.8761	81.3710	0.8206
87.1640	0.9613	86.7030	0.9145	85.6690	0.8591
90.0000	0.9472	90.0000	0.8922	90.0000	0.8380

TABLE 18. BOUNDARY CORRECTION FACTORS, F_b, FOR CRACK AT LOCATION 2 IN A COUNTERSUNK RIVET HOLE IN A PLATE UNDER BENDING FOR h/t = 0.05

$$(F_b = \frac{K_I}{S_b\sqrt{\pi a/Q}})$$

a/c = 1.0		a/c = 0.75		a/c = 0.50	
θ(deg)	F_b	θ(deg)	F_b	θ(deg)	F_b
0.0000	0.7085	0.0000	0.6608	0.0000	0.4983
3.0324	0.7525	2.6674	0.6839	2.3349	0.4922
6.0652	0.7371	5.3356	0.6692	4.6489	0.4957
9.3534	0.7386	8.2326	0.6692	7.1183	0.5009
12.6430	0.7376	11.1350	0.6723	9.5421	0.5194
16.2110	0.7385	14.2880	0.6724	12.1300	0.5364
19.7770	0.7403	17.4580	0.6835	14.6910	0.5618
23.6460	0.7451	20.9150	0.6905	17.4660	0.5833
27.5100	0.7512	24.4040	0.7056	20.2690	0.6105
31.7060	0.7582	28.2290	0.7182	23.3750	0.6359
35.9030	0.7698	32.1110	0.7358	26.5840	0.6634
40.4500	0.7791	36.4030	0.7538	30.2230	0.6897
44.9960	0.7935	40.7850	0.7742	34.0760	0.7177
49.5490	0.8061	45.2790	0.7939	38.1840	0.7430
54.0980	0.8229	49.8860	0.8162	42.5920	0.7689
58.2920	0.8371	54.2420	0.8352	46.9570	0.7916
62.4840	0.8552	58.7000	0.8575	51.6450	0.8146
66.3580	0.8729	62.8970	0.8773	56.2660	0.8363
70.2210	0.8924	67.1840	0.8996	61.1750	0.8572
73.7880	0.9149	71.2030	0.9234	65.9580	0.8803
77.3610	0.9368	75.2780	0.9444	70.9750	0.8974
80.6420	0.9757	79.0770	0.9822	75.7690	0.9319
83.9380	0.9653	82.9010	0.9728	80.7010	0.9220
86.9620	1.0875	86.4480	1.0836	85.3310	1.0173
90.0000	0.8451	90.0000	0.8546	90.0000	0.8126

TABLE 19. BOUNDARY CORRECTION FACTORS, F_b, FOR CRACK AT LOCATION 2 IN A COUNTERSUNK RIVET HOLE IN A PLATE UNDER BENDING FOR h/t = 0.25

$$(F_b = \frac{K_I}{S_b\sqrt{\pi a/Q}})$$

a/c = 1.0		a/c = 0.75		a/c = 0.50	
θ(deg)	F_b	θ(deg)	F_b	θ(deg)	F_b
0.0000	0.4087	0.0000	0.3082	0.0000	0.1900
4.5381	0.4585	2.0021	0.3456	1.7538	0.2058
9.0766	0.4803	4.0046	0.3503	3.4983	0.2168
14.2720	0.5162	6.1277	0.3663	5.3284	0.2315
19.4670	0.5559	8.2524	0.3810	7.1346	0.2512
25.4140	0.6011	10.5070	0.3968	9.0220	0.2710
31.3600	0.6555	12.7650	0.4165	10.8850	0.2959
38.1680	0.7135	15.1650	0.4362	12.8390	0.3206
44.9760	0.7818	17.5720	0.4597	14.7830	0.3491
51.7830	0.8449	20.1360	0.4836	16.8410	0.3775
58.5900	0.9173	22.7140	0.5105	18.9110	0.4087
64.5380	0.9798	25.4680	0.5380	21.1290	0.4401
70.4840	1.0445	28.2470	0.5687	23.3890	0.4739
75.6790	1.1220	31.2250	0.5993	25.8430	0.5079
80.8740	1.1590	34.2420	0.6335	28.3760	0.5439
85.4370	1.3275	37.4870	0.6672	31.1620	0.5806
90.0000	1.1497	40.7880	0.7043	34.0750	0.6189
		44.1480	0.7393	37.1310	0.6561
		47.5720	0.7770	40.3510	0.6947
		50.8650	0.8111	43.5550	0.7304
		54.2200	0.8477	46.9360	0.7673
		57.4410	0.8809	50.2990	0.8020
		60.7170	0.9166	53.8380	0.8379
		63.8580	0.9495	57.3430	0.8720
		67.0420	0.9855	61.0080	0.9077
		70.0860	1.0194	64.6140	0.9421
		73.1630	1.0562	68.3550	0.9782
		76.0930	1.0937	71.9980	1.0163
		79.0470	1.1305	75.7380	1.0505
		81.8520	1.1852	79.3420	1.1042
		84.6670	1.1823	83.0040	1.1083
		87.3330	1.3245	86.4940	1.2369
		90.0000	1.0622	90.0000	1.0180

TABLE 20. BOUNDARY CORRECTION FACTORS, F_b, FOR CRACK AT LOCATION 2 IN A COUNTERSUNK RIVET HOLE IN A PLATE UNDER BENDING FOR h/t = 0.50

$$(F_b = \frac{K_I}{S_b\sqrt{\pi a/Q}})$$

a/c = 1.0		a/c = 0.75		a/c = 0.50	
θ(deg)	F_b	θ(deg)	F_b	θ(deg)	F_b
0.0000	0.3515	0.0000	0.2734	0.0000	0.1847
4.5366	0.4137	2.0021	0.3145	1.7539	0.2032
9.0733	0.4481	4.0046	0.3237	3.4983	0.2158
14.2660	0.4972	6.1277	0.3443	5.3284	0.2332
19.4600	0.5516	8.2524	0.3632	7.1346	0.2549
25.4040	0.6130	10.5070	0.3843	9.0220	0.2773
31.3490	0.6854	12.7650	0.4082	10.8850	0.3048
38.1540	0.7636	15.1650	0.4335	12.8400	0.3319
44.9590	0.8557	17.5720	0.4623	14.7830	0.3633
51.7640	0.9431	20.1350	0.4916	16.8410	0.3944
58.5690	1.0446	22.7140	0.5251	18.9110	0.4289
64.5130	1.1339	25.4680	0.5585	21.1300	0.4637
70.4580	1.2287	28.2470	0.5965	23.3890	0.5011
75.6510	1.3390	31.2250	0.6345	25.8440	0.5395
80.8440	1.4020	34.2420	0.6767	28.3760	0.5803
85.4220	1.6259	37.4870	0.7197	31.1630	0.6226
90.0000	1.4418	40.7870	0.7665	34.0750	0.6674
		44.1470	0.8119	37.1310	0.7116
		47.5720	0.8613	40.3510	0.7587
		50.8650	0.9065	43.5550	0.8028
		54.2190	0.9559	46.9360	0.8500
		57.4410	1.0013	50.2990	0.8946
		60.7170	1.0510	53.8380	0.9425
		63.8570	1.0970	57.3420	0.9881
		67.0420	1.1486	61.0080	1.0377
		70.0860	1.1966	64.6150	1.0858
		73.1630	1.2505	68.3540	1.1381
		76.0940	1.3041	71.9980	1.1920
		79.0470	1.3599	75.7380	1.2452
		81.8510	1.4341	79.3420	1.3191
		84.6670	1.4539	83.0020	1.3464
		87.3310	1.6228	86.4930	1.5033
		90.0000	1.3622	90.0000	1.2990

TABLE 21. BOUNDARY CORRECTION FACTORS, F_b, FOR CRACK AT LOCATION 3 IN A COUNTERSUNK RIVET HOLE IN A PLATE UNDER BENDING FOR h/t = 0.05

$$(F_b = \frac{K_I}{S_b\sqrt{\pi a/Q}})$$

a/c = 1.0		a/c = 0.75		a/c = 0.50	
θ(deg)	F_b	θ(deg)	F_b	θ(deg)	F_b
0.0000	0.3544	0.0000	0.3274	0.0000	0.2753
1.3389	0.4461	1.1970	0.3994	1.2105	0.3068
2.6778	0.4563	2.3940	0.4040	2.4179	0.3167
4.0166	0.4948	3.6750	0.4335	3.7030	0.3347
5.3555	0.5167	4.9563	0.4528	4.9784	0.3558
6.6943	0.5428	6.3277	0.4753	6.3305	0.3775
8.0332	0.5675	7.6998	0.4997	7.6688	0.4050
9.3721	0.5931	9.1690	0.5250	9.0859	0.4328
10.7110	0.6186	10.6400	0.5539	10.4890	0.4662
12.0500	0.6447	12.2150	0.5829	11.9780	0.4996
13.3890	0.6711	13.7930	0.6166	13.4590	0.5386
14.7280	0.6983	15.4850	0.6501	15.0380	0.5776
16.0660	0.7260	17.1810	0.6890	16.6170	0.6220
17.4050	0.7531	19.0010	0.7276	18.3130	0.6671
18.7440	0.7827	20.8290	0.7724	20.0220	0.7175
20.0830	0.8098	22.6650	0.8142	21.7520	0.7657
21.4220	0.8411	24.5100	0.8622	23.5090	0.8199
22.7610	0.8686	26.2450	0.9045	25.1810	0.8684
24.1000	0.9009	27.9900	0.9542	26.8870	0.9236
25.4380	0.9295	29.6320	0.9960	28.5170	0.9728
26.7770	0.9620	31.2850	1.0496	30.1860	1.0331
28.1160	0.9925	32.8410	1.0902	31.7850	1.0813
29.4550	1.0263	34.4080	1.1563	33.4250	1.1580
30.7940	1.0573	35.8840	1.1866	34.9990	1.1981
32.1330	1.0931	37.3700	1.3033	36.6130	1.3369
33.4720	1.1252	38.7690	1.2769	38.1630	1.3130
34.8110	1.1630	40.1790	1.5791	39.7530	1.7212
36.1500	1.1970	41.5060	1.3242	41.2780	1.3956
37.4880	1.2398	42.8440	2.1050	42.8440	2.5200
38.8270	1.2735				
40.1660	1.3219				
41.5050	1.3562				
42.8440	1.3865				

TABLE 22. BOUNDARY CORRECTION FACTORS, F_b, FOR CRACK AT LOCATION 3 IN A COUNTERSUNK RIVET HOLE IN A PLATE UNDER BENDING FOR h/t = 0.25

$$(F_b = \frac{K_I}{S_b\sqrt{\pi a/Q}})$$

a/c = 1.0		a/c = 0.75		a/c = 0.50	
θ(deg)	F_b	θ(deg)	F_b	θ(deg)	F_b
0.0000	0.3670	0.0000	0.2756	0.0000	0.3459
1.7011	0.4516	1.5617	0.3009	1.2997	0.3964
3.4021	0.4669	3.1166	0.3137	2.5995	0.4088
5.1031	0.5035	4.6594	0.3334	3.9773	0.4307
6.8042	0.5285	6.1863	0.3565	5.3555	0.4484
8.5052	0.5567	7.6958	0.3796	6.8165	0.4685
10.2060	0.5837	9.1882	0.4077	8.2784	0.4905
11.9070	0.6121	10.6660	0.4346	9.8289	0.5134
13.6080	0.6413	12.1310	0.4658	11.3810	0.5394
15.3090	0.6703	13.5880	0.4954	13.0280	0.5657
17.0100	0.7009	15.0410	0.5287	14.6790	0.5959
18.7120	0.7316	16.4940	0.5603	16.4310	0.6262
20.4120	0.7631	17.9520	0.5950	18.1890	0.6607
22.1140	0.7954	19.4190	0.6285	20.0590	0.6956
23.8150	0.8291	20.8990	0.6646	21.9370	0.7347
25.5150	0.8619	22.3970	0.6999	23.9370	0.7747
27.2160	0.8971	23.9160	0.7375	25.9500	0.8192
28.9180	0.9321	25.4610	0.7748	27.9760	0.8627
30.6190	0.9689	27.0350	0.8145	30.0180	0.9104
32.3200	1.0052	28.6440	0.8540	31.9620	0.9551
34.0210	1.0448	30.2910	0.8966	33.9230	1.0041
35.7220	1.0828	31.9790	0.9389	35.7900	1.0499
37.4230	1.1254	33.7140	0.9854	37.6750	1.1022
39.1240	1.1655	35.4990	1.0317	39.4700	1.1487
40.8250	1.2133	37.3380	1.0841	41.2830	1.2073
42.5260	1.2556	39.2350	1.1362	43.0100	1.2544
44.2270	1.3123	41.1930	1.2013	44.7540	1.3285
45.9280	1.3558	43.2180	1.2591	46.4160	1.3709
47.6290	1.4383	45.3110	1.3539	48.0930	1.4990
49.3300	1.4680	47.4760	1.4219	49.6900	1.4923
51.0310	1.6596	49.7170	1.6485	51.3020	1.8522
52.7320	1.5881	52.0360	1.6678	52.8610	1.5981
54.4330	2.0810	54.4330	2.4350	54.4330	2.5786

TABLE 23. BOUNDARY CORRECTION FACTORS, F_b, FOR CRACK AT LOCATION 3 IN A COUNTERSUNK RIVET HOLE IN A PLATE UNDER BENDING FOR h/t = 0.5

$$(F_b = \frac{K_I}{S_b\sqrt{\pi a/Q}})$$

a/c = 1.0		a/c = 0.75		a/c = 0.50	
θ(deg)	F_b	θ(deg)	F_b	θ(deg)	F_b
0.0000	0.4158	0.0000	0.3754	0.0000	0.3337
2.1355	0.4851	1.9583	0.4237	1.8165	0.3534
4.2709	0.5058	3.9171	0.4361	3.6225	0.3648
6.4064	0.5367	5.8765	0.4594	5.4103	0.3834
8.5419	0.5624	7.8373	0.4807	7.1752	0.4073
10.6770	0.5894	9.8005	0.5031	8.9166	0.4309
12.8130	0.6177	11.7670	0.5290	10.6370	0.4604
14.9480	0.6463	13.7360	0.5542	12.3410	0.4882
17.0840	0.6766	15.7110	0.5830	14.0350	0.5204
19.2190	0.7071	17.6910	0.6112	15.7250	0.5506
21.3540	0.7391	19.6790	0.6425	17.4180	0.5842
23.4900	0.7716	21.6760	0.6732	19.1220	0.6162
25.6260	0.8057	23.6830	0.7068	20.8420	0.6506
27.7610	0.8398	25.7030	0.7398	22.5850	0.6840
29.8960	0.8761	27.7370	0.7757	24.3580	0.7195
32.0320	0.9119	29.7870	0.8108	26.1680	0.7543
34.1670	0.9505	31.8540	0.8493	28.0200	0.7911
36.3030	0.9887	33.9400	0.8869	29.9220	0.8276
38.4380	1.0295	36.0470	0.9279	31.8800	0.8666
40.5740	1.0707	38.1760	0.9686	33.8990	0.9056
42.7090	1.1147	40.3300	1.0131	35.9870	0.9476
44.8450	1.1593	42.5090	1.0576	38.1500	0.9902
46.9800	1.2079	44.7130	1.1071	40.3930	1.0370
49.1150	1.2571	46.9460	1.1564	42.7230	1.0848
51.2510	1.3126	49.2070	1.2137	45.1450	1.1392
53.3870	1.3682	51.4970	1.2695	47.6650	1.1947
55.5220	1.4377	53.8160	1.3433	50.2870	1.2634
57.6570	1.4997	56.1650	1.4049	53.0140	1.3288
59.7930	1.6004	58.5420	1.5174	55.8490	1.4258
61.9280	1.6701	60.9500	1.5821	58.7950	1.5161
64.0640	1.9022	63.3850	1.8692	61.8490	1.7277
66.1990	1.9219	65.8470	1.8353	65.0400	1.8232
68.3340	2.6565	68.3340	2.7595	68.3340	2.5938

TABLE 24. BOUNDARY CORRECTION FACTORS, F_b, FOR CRACK AT LOCATION 4 IN A COUNTERSUNK RIVET HOLE IN A PLATE UNDER BENDING FOR h/t = 0.05

$$(F_b = \frac{K_I}{S_b\sqrt{\pi a/Q}})$$

a/c = 1.0		a/c = 0.75		a/c = 0.50	
θ(deg)	F_b	θ(deg)	F_b	θ(deg)	F_b
0.0000	0.4327	0.0000	0.5022	0.0000	0.4592
1.2954	0.5380	1.2755	0.5408	1.2556	0.5428
2.5909	0.5572	2.5473	0.5475	2.5112	0.5545
3.8863	0.6020	3.8122	0.5676	3.7672	0.5886
5.1817	0.6314	5.0675	0.5900	5.0234	0.6131
6.4770	0.6645	6.3118	0.6132	6.2801	0.6398
7.7724	0.6959	7.5444	0.6428	7.5374	0.6679
9.0679	0.7287	8.7656	0.6714	8.7955	0.6962
10.3630	0.7617	9.9763	0.7057	10.0550	0.7270
11.6590	0.7948	11.1780	0.7385	11.3150	0.7576
12.9540	0.8294	12.3730	0.7759	12.5770	0.7907
14.2490	0.8637	13.5620	0.8120	13.8400	0.8237
15.5450	0.8994	14.7490	0.8520	15.1050	0.8592
16.8400	0.9353	15.9350	0.8911	16.3730	0.8943
18.1360	0.9722	17.1230	0.9335	17.6440	0.9327
19.4310	1.0095	18.3160	0.9756	18.9170	0.9697
20.7260	1.0480	19.5150	1.0210	20.1940	1.0110
22.0220	1.0866	20.7230	1.0663	21.4750	1.0507
23.3170	1.1272	21.9420	1.1157	22.7600	1.0949
24.6130	1.1672	23.1750	1.1652	24.0500	1.1381
25.9080	1.2101	24.4240	1.2200	25.3450	1.1860
27.2030	1.2519	25.6910	1.2757	26.6460	1.2335
28.4990	1.2981	26.9790	1.3382	27.9530	1.2866
29.7940	1.3421	28.2890	1.4031	29.2660	1.3394
31.0900	1.3921	29.6230	1.4765	30.5860	1.4001
32.3850	1.4400	30.9850	1.5578	31.9140	1.4614
33.6810	1.4936	32.3750	1.6445	33.2490	1.5332
34.9760	1.5485	33.7970	1.7595	34.5930	1.6082
36.2710	1.6062	35.2520	1.8470	35.9460	1.6953
37.5670	1.6802	36.7440	2.0797	37.3080	1.8120
38.8620	1.6973	38.2730	2.0837	38.6800	1.8945
40.1580	1.8639	39.8420	2.7945	40.0610	2.1793
41.4530	1.6222	41.4530	2.1478	41.4530	1.9862

TABLE 25. BOUNDARY CORRECTION FACTORS, F_b, FOR CRACK AT LOCATION 4 IN A COUNTERSUNK RIVET HOLE IN A PLATE UNDER BENDING FOR h/t = 0.25

$$(F_b = \frac{K_I}{S_b\sqrt{\pi a/Q}})$$

a/c = 1.0		a/c = 0.75		a/c = 0.50	
θ(deg)	F_b	θ(deg)	F_b	θ(deg)	F_b
0.0000	0.4348	0.0000	0.4541	0.0000	0.4890
1.5066	0.5324	1.4418	0.5289	1.4316	0.5206
3.0131	0.5529	2.8837	0.5409	2.8579	0.5278
4.5196	0.5950	4.3261	0.5725	4.2747	0.5471
6.0262	0.6246	5.7689	0.5963	5.6786	0.5701
7.5326	0.6569	7.2125	0.6227	7.0681	0.5938
9.0392	0.6888	8.6570	0.6506	8.4429	0.6243
10.5460	0.7213	10.1030	0.6790	9.8043	0.6537
12.0520	0.7548	11.5500	0.7102	11.1540	0.6885
13.5590	0.7884	13.0000	0.7410	12.4950	0.7219
15.0650	0.8237	14.4510	0.7749	13.8290	0.7596
16.5720	0.8586	15.9060	0.8082	15.1610	0.7961
18.0780	0.8955	17.3640	0.8446	16.4930	0.8361
19.5850	0.9318	18.8260	0.8806	17.8290	0.8752
21.0920	0.9707	20.2920	0.9197	19.1720	0.9175
22.5980	1.0086	21.7640	0.9585	20.5260	0.9594
24.1050	1.0493	23.2410	1.0002	21.8930	1.0046
25.6110	1.0894	24.7250	1.0422	23.2780	1.0498
27.1180	1.1325	26.2160	1.0876	24.6820	1.0991
28.6240	1.1744	27.7150	1.1330	26.1110	1.1489
30.1310	1.2208	29.2220	1.1831	27.5650	1.2038
31.6370	1.2654	30.7380	1.2333	29.0490	1.2604
33.1440	1.3160	32.2640	1.2895	30.5660	1.3238
34.6500	1.3645	33.8020	1.3464	32.1190	1.3904
36.1570	1.4201	35.3500	1.4118	33.7110	1.4656
37.6630	1.4753	36.9100	1.4794	35.3440	1.5515
39.1700	1.5376	38.4820	1.5574	37.0230	1.6392
40.6770	1.6037	40.0680	1.6446	38.7510	1.7657
42.1830	1.6758	41.6670	1.7375	40.5290	1.8459
43.6890	1.7687	43.2800	1.8838	42.3610	2.1181
45.1960	1.8267	44.9080	1.9698	44.2500	2.0661
46.7030	2.0332	46.5510	2.3487	46.1990	2.9430
48.2090	1.8526	48.2090	2.1060	48.2090	2.0438

TABLE 26. BOUNDARY CORRECTION FACTORS, F_b, FOR CRACK AT LOCATION 4 IN A COUNTERSUNK RIVET HOLE IN A PLATE UNDER BENDING FOR h/t = 0.5

$$(F_b = \frac{K_I}{S_b\sqrt{\pi a/Q}})$$

a/c = 1.0		a/c = 0.75		a/c = 0.50	
θ(deg)	F_b	θ(deg)	F_b	θ(deg)	F_b
0.0000	0.4498	0.0000	0.4607	0.0000	0.4857
1.8504	0.5380	1.7306	0.5248	1.6543	0.5097
3.7007	0.5587	3.4614	0.5368	3.3006	0.5173
5.5509	0.5970	5.1928	0.5649	4.9327	0.5359
7.4012	0.6261	6.9252	0.5886	6.5464	0.5604
9.2516	0.6573	8.6589	0.6140	8.1405	0.5850
11.1020	0.6891	10.3940	0.6424	9.7160	0.6174
12.9520	0.7211	12.1320	0.6709	11.2760	0.6477
14.8030	0.7552	13.8730	0.7027	12.8240	0.6840
16.6530	0.7888	15.6180	0.7343	14.3650	0.7180
18.5030	0.8247	17.3680	0.7692	15.9040	0.7566
20.3540	0.8604	19.1230	0.8036	17.4460	0.7935
22.2040	0.8984	20.8850	0.8414	18.9960	0.8340
24.0540	0.9356	22.6550	0.8785	20.5600	0.8733
25.9050	0.9762	24.4330	0.9194	22.1420	0.9160
27.7550	1.0153	26.2220	0.9594	23.7480	0.9578
29.6050	1.0584	28.0220	1.0035	25.3830	1.0034
31.4550	1.1002	29.8340	1.0470	27.0500	1.0488
33.3060	1.1459	31.6600	1.0953	28.7560	1.0986
35.1560	1.1913	33.5010	1.1431	30.5040	1.1491
37.0070	1.2410	35.3580	1.1966	32.3010	1.2053
38.8570	1.2907	37.2320	1.2506	34.1500	1.2636
40.7070	1.3463	39.1240	1.3119	36.0560	1.3295
42.5570	1.4018	41.0350	1.3744	38.0240	1.4003
44.4080	1.4658	42.9670	1.4469	40.0590	1.4790
46.2580	1.5316	44.9190	1.5247	42.1650	1.5739
48.1080	1.6075	46.8930	1.6114	44.3470	1.6643
49.9590	1.6921	48.8890	1.7192	46.6080	1.8121
51.8090	1.7814	50.9070	1.8149	48.9520	1.8798
53.6590	1.9185	52.9490	2.0222	51.3820	2.2250
55.5100	2.0093	55.0130	2.0697	53.9010	2.0684
57.3600	2.3468	57.1000	2.6780	56.5110	3.2491
59.2100	2.1737	59.2100	2.1741	59.2100	1.8032

TABLE 27. BOUNDARY CORRECTION FACTORS, F_b, FOR CRACK AT LOCATION 5 IN A COUNTERSUNK RIVET HOLE IN A PLATE UNDER BENDING FOR h/t = 0.05, 0.25, 0.5; AND a/c = 1.0

$$(F_b = \frac{K_I}{S_b\sqrt{\pi a/Q}})$$

h/t=0.05		h/t=0.25		h/t = 0.50	
θ(deg)	F_b	θ(deg)	F_b	θ(deg)	F_b
0.0000	0.3722	0.0000	0.3466	0.0000	0.3581
0.5832	0.5089	0.5832	0.4794	0.5832	0.4926
1.1664	0.5482	1.1664	0.5195	1.1664	0.5323
1.7497	0.6134	1.7497	0.5838	1.7497	0.5971
2.3329	0.6576	2.3329	0.6283	2.3329	0.6414
2.9161	0.7068	2.9161	0.6775	2.9161	0.6906
3.4993	0.7512	3.4993	0.7221	3.4993	0.7352
4.0825	0.7966	4.0825	0.7676	4.0825	0.7806
4.6657	0.8415	4.6657	0.8126	4.6657	0.8256
5.2489	0.8853	5.2489	0.8565	5.2489	0.8695
5.8322	0.9305	5.8322	0.9018	5.8322	0.9147
6.4154	0.9746	6.4154	0.9461	6.4154	0.9590
6.9986	1.0197	6.9986	0.9913	6.9986	1.0041
7.5818	1.0647	7.5818	1.0365	7.5818	1.0493
8.1650	1.1108	8.1650	1.0827	8.1650	1.0954
8.7483	1.1569	8.7483	1.1289	8.7483	1.1415
9.3315	1.2039	9.3315	1.1761	9.3315	1.1887
9.9147	1.2513	9.9147	1.2235	9.9147	1.2361
10.4980	1.3008	10.4980	1.2732	10.4980	1.2857
11.0810	1.3494	11.0810	1.3219	11.0810	1.3344
11.6640	1.4013	11.6640	1.3739	11.6640	1.3864
12.2480	1.4523	12.2480	1.4250	12.2480	1.4374
12.8310	1.5083	12.8310	1.4811	12.8310	1.4935
13.4140	1.5618	13.4140	1.5347	13.4140	1.5471
13.9970	1.6242	13.9970	1.5972	13.9970	1.6095
14.5800	1.6806	14.5800	1.6537	14.5800	1.6660
15.1640	1.7565	15.1640	1.7296	15.1640	1.7419
15.7470	1.8108	15.7470	1.7841	15.7470	1.7964
16.3300	1.9322	16.3300	1.9053	16.3300	1.9176
16.9130	1.9506	16.9130	1.9241	16.9130	1.9363
17.4970	2.2619	17.4970	2.2335	17.4970	2.2466
18.0800	2.0693	18.0800	2.0438	18.0800	2.0555
18.6630	2.9000	18.6630	2.8674	18.6630	2.8825

TABLE 28. BOUNDARY CORRECTION FACTORS, F_w, FOR CRACK AT LOCATION 1 IN A COUNTERSUNK RIVET HOLE IN A PLATE UNDER WEDGE LOADING FOR h/t = 0.05

$$(F_w = \frac{K_I}{S_w\sqrt{\pi a/Q}})$$

a/c = 1.0		a/c = 0.75		a/c = 0.50	
θ (deg)	F_w	θ (deg)	F_w	θ (deg)	F_w
0.0000	1.2759	0.0000	1.1546	0.0000	0.9753
4.5017	1.3076	3.9590	1.1453	3.4585	0.9248
9.0011	1.2700	7.9219	1.1222	6.8553	0.9425
13.4990	1.2565	11.8920	1.1115	10.1690	0.9499
17.9970	1.2433	15.8760	1.1099	13.4160	0.9855
22.4970	1.2328	19.8910	1.1132	16.6450	1.0121
26.9950	1.2281	23.9430	1.1260	19.8960	1.0486
31.4940	1.2233	28.0380	1.1315	23.2170	1.0739
35.9950	1.2212	32.2010	1.1470	26.6610	1.1066
40.5000	1.2228	36.4500	1.1600	30.2670	1.1308
44.9970	1.2256	40.7850	1.1765	34.0760	1.1577
49.4930	1.2255	45.2250	1.1898	38.1340	1.1796
54.0080	1.2380	49.7860	1.2085	42.4970	1.2041
58.5050	1.2394	54.4620	1.2232	47.1800	1.2227
62.9990	1.2521	59.2540	1.2421	52.2360	1.2432
67.4940	1.2592	64.1590	1.2573	57.6800	1.2619
71.9900	1.2768	69.1840	1.2776	63.5290	1.2796
76.4910	1.2932	74.2910	1.2976	69.7500	1.2999
81.0020	1.3113	79.4760	1.3106	76.2990	1.3063
85.5030	1.3526	84.7310	1.3523	83.0770	1.3378
90.0000	1.3285	90.0000	1.3010	90.0000	1.2664

TABLE 29. BOUNDARY CORRECTION FACTORS, F_w, FOR CRACK AT LOCATION 1 IN A COUNTERSUNK RIVET HOLE IN A PLATE UNDER WEDGE LOADING FOR h/t = 0.25

$$(F_w = \frac{K_I}{S_w \sqrt{\pi a/Q}})$$

a/c = 1.0		a/c = 0.75		a/c = 0.50	
θ (deg)	F_w	θ (deg)	F_w	θ (deg)	F_w
0.0000	1.0089	0.0000	0.8477	0.0000	0.6640
4.4995	1.0398	2.4740	0.8804	2.1659	0.6559
8.9986	1.0151	4.9483	0.8591	4.3147	0.6537
13.4980	1.0109	7.4247	0.8578	6.4345	0.6555
17.9980	1.0089	9.9041	0.8559	8.5205	0.6705
22.4960	1.0050	12.3880	0.8549	10.5760	0.6829
26.9960	1.0107	14.8790	0.8604	12.6080	0.7037
31.4940	1.0117	17.3790	0.8635	14.6270	0.7204
35.9950	1.0226	19.8900	0.8736	16.6440	0.7442
40.4930	1.0276	22.4150	0.8790	18.6700	0.7619
44.9930	1.0406	24.9590	0.8920	20.7180	0.7855
49.4930	1.0505	27.5240	0.9004	22.7980	0.8042
53.9910	1.0658	30.1140	0.9141	24.9220	0.8264
58.4900	1.0788	32.7310	0.9246	27.1010	0.8460
62.9890	1.0981	35.3810	0.9394	29.3450	0.8665
67.4880	1.1143	38.0650	0.9509	31.6660	0.8864
71.9890	1.1385	40.7880	0.9666	34.0740	0.9063
76.4860	1.1613	43.5510	0.9788	36.5800	0.9253
80.9880	1.1863	46.3580	0.9951	39.1960	0.9450
85.4940	1.2303	49.2070	1.0073	41.9290	0.9633
90.0000	1.2235	52.1060	1.0244	44.7930	0.9823
		55.0490	1.0373	47.7930	1.0002
		58.0430	1.0538	50.9390	1.0186
		61.0800	1.0685	54.2350	1.0363
		64.1590	1.0842	57.6880	1.0542
		67.2870	1.1003	61.2950	1.0718
		70.4510	1.1174	65.0510	1.0892
		73.6480	1.1341	68.9550	1.1070
		76.8800	1.1518	72.9860	1.1232
		80.1370	1.1725	77.1320	1.1433
		83.4130	1.1789	81.3690	1.1466
		86.7050	1.2172	85.6690	1.1791
		90.0000	1.1495	90.0000	1.1036

TABLE 30. BOUNDARY CORRECTION FACTORS, F_w, FOR CRACK AT LOCATION 1 IN A COUNTERSUNK RIVET HOLE IN A PLATE UNDER WEDGE LOADING FOR h/t = 0.50

$$(F_w = \frac{K_I}{S_w\sqrt{\pi a/Q}})$$

a/c = 1.0		a/c = 0.75		a/c = 0.50	
θ (deg)	F_w	θ (deg)	F_w	θ (deg)	F_w
0.0000	0.8549	0.0000	0.7147	0.0000	0.5248
2.8109	0.9151	2.4736	0.7428	2.1660	0.5193
5.6219	0.8907	4.9481	0.7264	4.3147	0.5182
8.4328	0.8940	7.4249	0.7255	6.4343	0.5198
11.2440	0.8892	9.9045	0.7254	8.5205	0.5338
14.0550	0.8846	12.3880	0.7248	10.5760	0.5440
16.8660	0.8841	14.8790	0.7309	12.6080	0.5635
19.6770	0.8836	17.3790	0.7353	14.6270	0.5789
22.4880	0.8855	19.8890	0.7448	16.6430	0.5998
25.2990	0.8871	22.4150	0.7525	18.6700	0.6180
28.1100	0.8919	24.9580	0.7651	20.7180	0.6396
30.9210	0.8951	27.5230	0.7753	22.7980	0.6591
33.7320	0.9020	30.1130	0.7893	24.9220	0.6809
36.5430	0.9073	32.7310	0.8023	27.1010	0.7013
39.3540	0.9154	35.3800	0.8174	29.3460	0.7233
42.1650	0.9228	38.0650	0.8317	31.6660	0.7440
44.9760	0.9324	40.7880	0.8485	34.0750	0.7663
47.7870	0.9412	43.5510	0.8638	36.5810	0.7874
50.5980	0.9527	46.3560	0.8811	39.1960	0.8097
53.4080	0.9624	49.2080	0.8979	41.9290	0.8312
56.2200	0.9759	52.1050	0.9160	44.7920	0.8537
59.0320	0.9876	55.0490	0.9334	47.7920	0.8755
61.8410	1.0020	58.0410	0.9529	50.9370	0.8982
64.6520	1.0152	61.0780	0.9708	54.2350	0.9205
67.4630	1.0320	64.1610	0.9915	57.6860	0.9434
70.2740	1.0473	67.2850	1.0105	61.2930	0.9662
73.0850	1.0661	70.4490	1.0318	65.0510	0.9894
75.8960	1.0841	73.6500	1.0528	68.9550	1.0128
78.7090	1.1060	76.8800	1.0747	72.9880	1.0358
81.5190	1.1291	80.1370	1.0998	77.1350	1.0616
84.3300	1.1460	83.4130	1.1130	81.3710	1.0742
87.1640	1.1868	86.7030	1.1532	85.6690	1.1116
90.0000	1.1503	90.0000	1.1026	90.0000	1.0563

TABLE 31. BOUNDARY CORRECTION FACTORS, F_w, FOR CRACK AT LOCATION 2 IN A COUNTERSUNK RIVET HOLE IN A PLATE UNDER WEDGE LOADING FOR h/t = 0.05

$$(F_w = \frac{K_I}{S_w\sqrt{\pi a/Q}})$$

a/c = 1.0		a/c = 0.75		a/c = 0.50	
θ (deg)	F_w	θ (deg)	F_w	θ (deg)	F_w
0.0000	1.2821	0.0000	1.2484	0.0000	0.9494
3.0324	1.3492	2.6674	1.2805	2.3349	0.9277
6.0652	1.3123	5.3356	1.2444	4.6489	0.9249
9.3534	1.3044	8.2326	1.2340	7.1183	0.9233
12.6430	1.2920	11.1350	1.2291	9.5421	0.9457
16.2110	1.2818	14.2880	1.2176	12.1300	0.9641
19.7770	1.2733	17.4580	1.2258	14.6910	0.9973
23.6460	1.2686	20.9150	1.2256	17.4660	1.0223
27.5100	1.2662	24.4040	1.2398	20.2690	1.0574
31.7060	1.2645	28.2290	1.2486	23.3750	1.0880
35.9030	1.2705	32.1110	1.2663	26.5840	1.1226
40.4500	1.2720	36.4030	1.2838	30.2230	1.1540
44.9960	1.2823	40.7850	1.3060	34.0760	1.1886
49.5490	1.2901	45.2790	1.3270	38.1840	1.2187
54.0980	1.3054	49.8860	1.3532	42.5920	1.2502
58.2920	1.3176	54.2420	1.3748	46.9570	1.2774
62.4840	1.3371	58.7000	1.4025	51.6450	1.3054
66.3580	1.3566	62.8970	1.4270	56.2660	1.3318
70.2210	1.3799	67.1840	1.4560	61.1750	1.3573
73.7880	1.4080	71.2030	1.4878	65.9580	1.3864
77.3610	1.4369	75.2780	1.5161	70.9750	1.4069
80.6420	1.4897	79.0770	1.5694	75.7690	1.4525
83.9380	1.4740	82.9010	1.5531	80.7010	1.4333
86.9620	1.6465	86.4480	1.7148	85.3310	1.5656
90.0000	1.3035	90.0000	1.3725	90.0000	1.2600

TABLE 32. BOUNDARY CORRECTION FACTORS, F_w, FOR CRACK AT LOCATION 2 IN A COUNTERSUNK RIVET HOLE IN A PLATE UNDER WEDGE LOADING FOR h/t = 0.25

$$(F_w = \frac{K_I}{S_w \sqrt{\pi a/Q}})$$

a/c = 1.0		a/c = 0.75		a/c = 0.50	
θ (deg)	F_w	θ (deg)	F_w	θ (deg)	F_w
0.0000	0.9420	0.0000	0.7635	0.0000	0.5678
4.5381	0.9747	2.0021	0.8095	1.7538	0.5714
9.0766	0.9575	4.0046	0.7902	3.4983	0.5670
14.2720	0.9577	6.1277	0.7919	5.3284	0.5672
19.4670	0.9626	8.2524	0.7909	7.1346	0.5786
25.4140	0.9689	10.5070	0.7897	9.0220	0.5876
31.3600	0.9894	12.7650	0.7955	10.8850	0.6064
38.1680	1.0081	15.1650	0.7996	12.8390	0.6227
44.9760	1.0441	17.5720	0.8098	14.7830	0.6457
51.7830	1.0748	20.1360	0.8191	16.8410	0.6669
58.5900	1.1223	22.7140	0.8333	18.9110	0.6927
64.5380	1.1635	25.4680	0.8470	21.1290	0.7172
70.4840	1.2131	28.2470	0.8658	23.3890	0.7455
75.6790	1.2780	31.2250	0.8831	25.8430	0.7728
80.8740	1.3066	34.2420	0.9059	28.3760	0.8033
85.4370	1.4681	37.4870	0.9269	31.1620	0.8333
90.0000	1.2742	40.7880	0.9532	34.0750	0.8661
		44.1480	0.9770	37.1310	0.8972
		47.5720	1.0051	40.3510	0.9305
		50.8650	1.0299	43.5550	0.9610
		54.2200	1.0585	46.9360	0.9931
		57.4410	1.0841	50.2990	1.0232
		60.7170	1.1133	53.8380	1.0547
		63.8580	1.1400	57.3430	1.0847
		67.0420	1.1707	61.0080	1.1162
		70.0860	1.1996	64.6140	1.1467
		73.1630	1.2319	68.3550	1.1785
		76.0930	1.2652	71.9980	1.2125
		79.0470	1.2980	75.7380	1.2416
		81.8520	1.3487	79.3420	1.2905
		84.6670	1.3390	83.0040	1.2851
		87.3330	1.4781	86.4940	1.4081
		90.0000	1.1954	90.0000	1.1568

TABLE 33. BOUNDARY CORRECTION FACTORS, F_w, FOR CRACK AT LOCATION 2 IN A COUNTERSUNK RIVET HOLE IN A PLATE UNDER WEDGE LOADING FOR h/t = 0.50

$$(F_w = \frac{K_I}{S_w\sqrt{\pi a/Q}})$$

a/c = 1.0		a/c = 0.75		a/c = 0.50	
(deg)	F_w	(deg)	F_w	θ (deg)	F_w
0.0000	0.7972	0.0000	0.6371	0.0000	0.4606
4.5366	0.8256	2.0021	0.6753	1.7539	0.4619
9.0733	0.8085	4.0046	0.6569	3.4983	0.4548
14.2660	0.8066	6.1277	0.6571	5.3284	0.4529
19.4600	0.8101	8.2524	0.6539	7.1346	0.4590
25.4040	0.8146	10.5070	0.6521	9.0220	0.4641
31.3490	0.8333	12.7650	0.6546	10.8850	0.4772
38.1540	0.8517	15.1650	0.6572	12.8400	0.4881
44.9590	0.8884	17.5720	0.6648	14.7830	0.5055
51.7640	0.9222	20.1350	0.6714	16.8410	0.5210
58.5690	0.9750	22.7140	0.6838	18.9110	0.5414
64.5130	1.0221	25.4680	0.6946	21.1300	0.5610
70.4580	1.0806	28.2470	0.7115	23.3890	0.5843
75.6510	1.1526	31.2250	0.7269	25.8440	0.6078
80.8440	1.1935	34.2420	0.7479	28.3760	0.6344
85.4220	1.3555	37.4870	0.7685	31.1630	0.6620
90.0000	1.2021	40.7870	0.7942	34.0750	0.6927
		44.1470	0.8185	37.1310	0.7230
		47.5720	0.8479	40.3510	0.7568
		50.8650	0.8744	43.5550	0.7883
		54.2190	0.9057	46.9360	0.8231
		57.4410	0.9342	50.2990	0.8560
		60.7170	0.9674	53.8380	0.8921
		63.8570	0.9980	57.3420	0.9264
		67.0420	1.0337	61.0080	0.9640
		70.0860	1.0669	64.6150	1.0004
		73.1630	1.1052	68.3540	1.0397
		76.0940	1.1433	71.9980	1.0801
		79.0470	1.1831	75.7380	1.1189
		81.8510	1.2365	79.3420	1.1732
		84.6670	1.2466	83.0020	1.1877
		87.3310	1.3702	86.4930	1.3022
		90.0000	1.1545	90.0000	1.1176

TABLE 34. BOUNDARY CORRECTION FACTORS, F_w, FOR CRACK AT LOCATION 3 IN A COUNTERSUNK RIVET HOLE IN A PLATE UNDER WEDGE LOADING FOR h/t = 0.05

$$(F_w = \frac{K_I}{S_w\sqrt{\pi a/Q}})$$

a/c = 1.0		a/c = 0.75		a/c = 0.50	
θ (deg)	F_w	θ (deg)	F_w	θ (deg)	F_w
0.0000	0.6336	0.0000	0.5764	0.0000	0.4869
1.3389	0.7273	1.1970	0.6480	1.2105	0.5054
2.6778	0.7067	2.3940	0.6272	2.4179	0.4957
4.0166	0.7282	3.6750	0.6395	3.7030	0.4946
5.3555	0.7265	4.9563	0.6383	4.9784	0.4977
6.6943	0.7303	6.3277	0.6385	6.3305	0.4994
8.0332	0.7322	7.6998	0.6412	7.6688	0.5080
9.3721	0.7353	9.1690	0.6431	9.0859	0.5155
10.7110	0.7379	10.6400	0.6488	10.4890	0.5286
12.0500	0.7413	12.2150	0.6530	11.9780	0.5406
13.3890	0.7448	13.7930	0.6617	13.4590	0.5580
14.7280	0.7493	15.4850	0.6688	15.0380	0.5741
16.0660	0.7541	17.1810	0.6808	16.6170	0.5952
17.4050	0.7584	19.0010	0.6911	18.3130	0.6158
18.7440	0.7650	20.8290	0.7070	20.0220	0.6410
20.0830	0.7693	22.6650	0.7203	21.7520	0.6645
21.4220	0.7774	24.5100	0.7389	23.5090	0.6929
22.7610	0.7821	26.2450	0.7545	25.1810	0.7180
24.1000	0.7911	27.9900	0.7756	26.8870	0.7483
25.4380	0.7969	29.6320	0.7923	28.5170	0.7750
26.7770	0.8061	31.2850	0.8173	30.1860	0.8096
28.1160	0.8136	32.8410	0.8347	31.7850	0.8367
29.4550	0.8238	34.4080	0.8684	33.4250	0.8828
30.7940	0.8319	35.8840	0.8806	34.9990	0.9055
32.1330	0.8437	37.3700	0.9474	36.6130	0.9932
33.4720	0.8529	38.7690	0.9239	38.1630	0.9737
34.8110	0.8658	40.1790	1.1125	39.7530	1.2451
36.1500	0.8767	41.5060	0.9351	41.2780	1.0128
37.4880	0.8921	42.8440	1.4443	42.8440	1.7796
38.8270	0.9035				
40.1660	0.9190				
41.5050	0.9322				
42.8440	0.9244				

TABLE 35. BOUNDARY CORRECTION FACTORS, F_w, FOR CRACK AT LOCATION 3 IN A COUNTERSUNK RIVET HOLE IN A PLATE UNDER WEDGE LOADING FOR h/t = 0.25

$$(F_w = \frac{K_I}{S_w\sqrt{\pi a/Q}})$$

a/c = 1.0		a/c = 0.75		a/c = 0.50	
θ (deg)	F_w	θ (deg)	F_w	θ (deg)	F_w
0.0000	0.6770	0.0000	0.6097	0.0000	0.4752
1.7011	0.7579	1.2997	0.6524	1.5617	0.4807
3.4021	0.7393	2.5995	0.6433	3.1166	0.4698
5.1031	0.7537	3.9773	0.6454	4.6594	0.4680
6.8042	0.7512	5.3555	0.6421	6.1863	0.4702
8.5052	0.7530	6.8165	0.6400	7.6958	0.4723
10.2060	0.7531	8.2784	0.6404	9.1882	0.4805
11.9070	0.7551	9.8289	0.6401	10.6660	0.4871
13.6080	0.7577	11.3810	0.6434	12.1310	0.4986
15.3090	0.7601	13.0280	0.6456	13.5880	0.5085
17.0100	0.7641	14.6790	0.6518	15.0410	0.5222
18.7120	0.7684	16.4310	0.6567	16.4940	0.5344
20.4120	0.7733	18.1890	0.6660	17.9520	0.5499
22.1140	0.7791	20.0590	0.6742	19.4190	0.5642
23.8150	0.7862	21.9370	0.6865	20.8990	0.5811
25.5150	0.7926	23.9370	0.6985	22.3970	0.5974
27.2160	0.8012	25.9500	0.7145	23.9160	0.6160
28.9180	0.8098	27.9760	0.7298	25.4610	0.6343
30.6190	0.8198	30.0180	0.7488	27.0350	0.6548
32.3200	0.8297	31.9620	0.7666	28.6440	0.6752
34.0210	0.8422	33.9230	0.7879	30.2910	0.6983
35.7220	0.8535	35.7900	0.8079	31.9790	0.7211
37.4230	0.8685	37.6750	0.8327	33.7140	0.7473
39.1240	0.8818	39.4700	0.8543	35.4990	0.7734
40.8250	0.9005	41.2830	0.8843	37.3380	0.8039
42.5260	0.9158	43.0100	0.9075	39.2350	0.8344
44.2270	0.9403	44.7540	0.9480	41.1930	0.8737
45.9280	0.9573	46.4160	0.9692	43.2180	0.9085
47.6290	0.9974	48.0930	1.0441	45.3110	0.9667
49.3300	1.0070	49.6900	1.0350	47.4760	1.0091
51.0310	1.1132	51.3020	1.2591	49.7170	1.1517
52.7320	1.0588	52.8610	1.0846	52.0360	1.1591
54.4330	1.3493	54.4330	1.7129	54.4330	1.6514

TABLE 36. BOUNDARY CORRECTION FACTORS, F_w, FOR CRACK AT LOCATION 3 IN A COUNTERSUNK RIVET HOLE IN A PLATE UNDER WEDGE LOADING FOR h/t = 0.50

$$(F_w = \frac{K_I}{S_w\sqrt{\pi a/Q}})$$

a/c = 1.0		a/c = 0.75		a/c = 0.50	
θ (deg)	F_w	θ (deg)	F_w	θ (deg)	F_w
0.0000	0.7214	0.0000	0.6126	0.0000	0.4849
2.1355	0.7750	1.9583	0.6420	1.8165	0.4802
4.2709	0.7606	3.9171	0.6239	3.6225	0.4666
6.4064	0.7632	5.8765	0.6213	5.4103	0.4609
8.5419	0.7572	7.8373	0.6150	7.1752	0.4613
10.6770	0.7536	9.8005	0.6105	8.9166	0.4613
12.8130	0.7511	11.7670	0.6096	10.6370	0.4680
14.9480	0.7491	13.7360	0.6082	12.3410	0.4730
17.0840	0.7491	15.7110	0.6109	14.0350	0.4830
19.2190	0.7492	17.6910	0.6129	15.7250	0.4913
21.3540	0.7511	19.6790	0.6184	17.4180	0.5033
23.4900	0.7535	21.6760	0.6234	19.1220	0.5142
25.6260	0.7577	23.6830	0.6316	20.8420	0.5278
27.7610	0.7620	25.7030	0.6393	22.5850	0.5408
29.8960	0.7686	27.7370	0.6500	24.3580	0.5561
32.0320	0.7748	29.7870	0.6602	26.1680	0.5712
34.1670	0.7838	31.8540	0.6736	28.0200	0.5884
36.3030	0.7925	33.9400	0.6865	29.9220	0.6057
38.4380	0.8036	36.0470	0.7024	31.8800	0.6253
40.5740	0.8153	38.1760	0.7183	33.8990	0.6452
42.7090	0.8293	40.3300	0.7374	35.9870	0.6678
44.8450	0.8440	42.5090	0.7566	38.1500	0.6909
46.9800	0.8619	44.7130	0.7797	40.3930	0.7175
49.1150	0.8803	46.9460	0.8029	42.7230	0.7448
51.2510	0.9033	49.2070	0.8317	45.1450	0.7769
53.3870	0.9266	51.4970	0.8599	47.6650	0.8099
55.5220	0.9589	53.8160	0.8994	50.2870	0.8516
57.6570	0.9872	56.1650	0.9321	53.0140	0.8914
59.7930	1.0383	58.5420	0.9951	55.8490	0.9503
61.9280	1.0729	60.9500	1.0312	58.7950	1.0065
64.0640	1.2010	63.3850	1.1988	61.8490	1.1341
66.1990	1.2049	65.8470	1.1725	65.0400	1.1899
68.3340	1.6279	68.3340	1.7235	68.3340	1.6554

TABLE 37. BOUNDARY CORRECTION FACTORS, F_w, FOR CRACK AT LOCATION 4 IN A COUNTERSUNK RIVET HOLE IN A PLATE UNDER TENSION FOR h/t = 0.05

$$(F_w = \frac{K_I}{S_w\sqrt{\pi a/Q}})$$

a/c = 1.0		a/c = 0.75		a/c = 0.50	
θ (deg)	F_w	θ (deg)	F_w	θ (deg)	F_w
0.0000	0.5428	0.0000	0.5238	0.0000	0.4920
1.2954	0.6096	1.2556	0.5711	1.2755	0.4997
2.5909	0.5922	2.5112	0.5517	2.5473	0.4816
3.8863	0.6023	3.7672	0.5546	3.8122	0.4743
5.1817	0.5971	5.0234	0.5481	5.0675	0.4686
6.4770	0.5956	6.2801	0.5438	6.3118	0.4634
7.7724	0.5924	7.5374	0.5403	7.5444	0.4630
9.0679	0.5905	8.7955	0.5371	8.7656	0.4618
10.3630	0.5887	10.0550	0.5356	9.9763	0.4646
11.6590	0.5869	11.3150	0.5340	11.1780	0.4663
12.9540	0.5861	12.5770	0.5342	12.3730	0.4711
14.2490	0.5851	13.8400	0.5342	13.5620	0.4752
15.5450	0.5851	15.1050	0.5358	14.7490	0.4815
16.8400	0.5851	16.3730	0.5373	15.9350	0.4873
18.1360	0.5857	17.6440	0.5405	17.1230	0.4950
19.4310	0.5866	18.9170	0.5431	18.3160	0.5026
20.7260	0.5880	20.1940	0.5480	19.5150	0.5117
22.0220	0.5896	21.4750	0.5520	20.7230	0.5208
23.3170	0.5920	22.7600	0.5582	21.9420	0.5316
24.6130	0.5943	24.0500	0.5639	23.1750	0.5425
25.9080	0.5976	25.3450	0.5715	24.4240	0.5555
27.2030	0.6006	26.6460	0.5791	25.6910	0.5688
28.4990	0.6051	27.9530	0.5886	26.9790	0.5847
29.7940	0.6088	29.2660	0.5982	28.2890	0.6014
31.0900	0.6145	30.5860	0.6104	29.6230	0.6212
32.3850	0.6195	31.9140	0.6230	30.9850	0.6438
33.6810	0.6258	33.2490	0.6389	32.3750	0.6687
34.9760	0.6327	34.5930	0.6556	33.7970	0.7023
36.2710	0.6397	35.9460	0.6772	35.2520	0.7296
37.5670	0.6513	37.3080	0.7060	36.7440	0.8015
38.8620	0.6432	38.6800	0.7290	38.2730	0.8099
40.1580	0.6803	40.0610	0.8060	39.8420	1.0353
41.4530	0.5840	41.4530	0.7530	41.4530	0.8625

TABLE 38. BOUNDARY CORRECTION FACTORS, F_w, FOR CRACK AT LOCATION 4 IN A COUNTERSUNK RIVET HOLE IN A PLATE UNDER WEDGE LOADING FOR h/t = 0.25

$$(F_w = \frac{K_I}{S_w\sqrt{\pi a/Q}})$$

a/c = 1.0		a/c = 0.75		a/c = 0.50	
θ (deg)	F_w	θ (deg)	F_w	θ (deg)	F_w
0.0000	0.5856	0.0000	0.5512	0.0000	0.4977
1.5066	0.6497	1.4418	0.5932	1.4316	0.4996
3.0131	0.6322	2.8837	0.5730	2.8579	0.4811
4.5196	0.6401	4.3261	0.5735	4.2747	0.4726
6.0262	0.6342	5.7689	0.5658	5.6786	0.4671
7.5326	0.6316	7.2125	0.5607	7.0681	0.4619
9.0392	0.6281	8.6570	0.5566	8.4429	0.4623
10.5460	0.6254	10.1030	0.5530	9.8043	0.4616
12.0520	0.6235	11.5500	0.5517	11.1540	0.4651
13.5590	0.6216	13.0000	0.5499	12.4950	0.4676
15.0650	0.6210	14.4510	0.5507	13.8290	0.4731
16.5720	0.6201	15.9060	0.5509	15.1610	0.4780
18.0780	0.6207	17.3640	0.5534	16.4930	0.4851
19.5850	0.6208	18.8260	0.5556	17.8290	0.4919
21.0920	0.6226	20.2920	0.5597	19.1720	0.5005
22.5980	0.6239	21.7640	0.5638	20.5260	0.5090
24.1050	0.6267	23.2410	0.5695	21.8930	0.5192
25.6110	0.6293	24.7250	0.5755	23.2780	0.5295
27.1180	0.6334	26.2160	0.5831	24.6820	0.5416
28.6240	0.6370	27.7150	0.5909	26.1110	0.5542
30.1310	0.6426	29.2220	0.6007	27.5650	0.5689
31.6370	0.6475	30.7380	0.6108	29.0490	0.5844
33.1440	0.6548	32.2640	0.6231	30.5660	0.6027
34.6500	0.6613	33.8020	0.6360	32.1190	0.6224
36.1570	0.6704	35.3500	0.6520	33.7110	0.6456
37.6630	0.6794	36.9100	0.6690	35.3440	0.6728
39.1700	0.6906	38.4820	0.6899	37.0230	0.7016
40.6770	0.7033	40.0680	0.7136	38.7510	0.7435
42.1830	0.7179	41.6670	0.7412	40.5290	0.7724
43.6890	0.7382	43.2800	0.7843	42.3610	0.8667
45.1960	0.7480	44.9080	0.8151	44.2500	0.8589
46.7030	0.8018	46.5510	0.9326	46.1990	1.1674
48.2090	0.7306	48.2090	0.8697	48.2090	0.8999

TABLE 39. BOUNDARY CORRECTION FACTORS, F_w, FOR CRACK AT LOCATION 4 IN A COUNTERSUNK RIVET HOLE IN A PLATE UNDER WEDGE LOADING FOR h/t = 0.50

$$(F_w = \frac{K_I}{S_w\sqrt{\pi a/Q}})$$

a/c = 1.0		a/c = 0.75		a/c = 0.50	
θ (deg)	F_w	θ (deg)	F_w	θ (deg)	F_w
0.0000	0.6412	0.0000	0.5821	0.0000	0.5073
1.8504	0.6993	1.7306	0.6154	1.6543	0.5018
3.7007	0.6808	3.4614	0.5942	3.3006	0.4826
5.5509	0.6848	5.1928	0.5911	4.9327	0.4725
7.4012	0.6775	6.9252	0.5824	6.5464	0.4674
9.2516	0.6730	8.6589	0.5757	8.1405	0.4623
11.1020	0.6686	10.3940	0.5716	9.7160	0.4637
12.9520	0.6647	12.1320	0.5676	11.2760	0.4635
14.8030	0.6626	13.8730	0.5665	12.8240	0.4682
16.6530	0.6601	15.6180	0.5653	14.3650	0.4714
18.5030	0.6596	17.3680	0.5669	15.9040	0.4780
20.3540	0.6590	19.1230	0.5682	17.4460	0.4838
22.2040	0.6602	20.8850	0.5721	18.9960	0.4921
24.0540	0.6610	22.6550	0.5757	20.5600	0.4999
25.9050	0.6642	24.4330	0.5820	22.1420	0.5099
27.7550	0.6666	26.2220	0.5879	23.7480	0.5196
29.6050	0.6716	28.0220	0.5963	25.3830	0.5316
31.4550	0.6759	29.8340	0.6046	27.0500	0.5436
33.3060	0.6825	31.6600	0.6156	28.7560	0.5581
35.1560	0.6891	33.5010	0.6265	30.5040	0.5730
37.0070	0.6980	35.3580	0.6404	32.3010	0.5909
38.8570	0.7070	37.2320	0.6547	34.1500	0.6098
40.7070	0.7188	39.1240	0.6724	36.0560	0.6325
42.5570	0.7307	41.0350	0.6908	38.0240	0.6573
44.4080	0.7464	42.9670	0.7139	40.0590	0.6863
46.2580	0.7629	44.9190	0.7392	42.1650	0.7220
48.1080	0.7837	46.8930	0.7689	44.3470	0.7574
49.9590	0.8078	48.8890	0.8063	46.6080	0.8153
51.8090	0.8351	50.9070	0.8424	48.9520	0.8453
53.6590	0.8785	52.9490	0.9185	51.3820	0.9844
55.5100	0.9109	55.0130	0.9455	53.9010	0.9372
57.3600	1.0253	57.1000	1.1739	56.5110	1.4145
59.2100	0.9702	59.2100	1.0186	59.2100	0.9153

TABLE 40. BOUNDARY CORRECTION FACTORS, F_w, FOR CRACK AT LOCATION 5 IN A COUNTERSUNK RIVET HOLE IN A PLATE UNDER WEDGE LOADING FOR h/t = 0.05, 0.25, 0.5; AND a/c = 1.0

$$(F_w = \frac{K_I}{S_w\sqrt{\pi a/Q}})$$

h/t=0.05		h/t=0.25		h/t = 0.50	
θ (deg)	F_w	θ (deg)	F_w	θ (deg)	F_w
0.0000	0.4007	0.0000	0.3950	0.0000	0.3888
0.5832	0.4631	0.5832	0.4565	0.5832	0.4495
1.1664	0.4544	1.1664	0.4479	1.1664	0.4411
1.7497	0.4682	1.7497	0.4615	1.7497	0.4546
2.3329	0.4669	2.3329	0.4603	2.3329	0.4535
2.9161	0.4696	2.9161	0.4630	2.9161	0.4562
3.4993	0.4695	3.4993	0.4629	3.4993	0.4562
4.0825	0.4701	4.0825	0.4636	4.0825	0.4570
4.6657	0.4706	4.6657	0.4640	4.6657	0.4575
5.2489	0.4705	5.2489	0.4639	5.2489	0.4575
5.8322	0.4711	5.8322	0.4646	5.8322	0.4582
6.4154	0.4712	6.4154	0.4647	6.4154	0.4584
6.9986	0.4716	6.9986	0.4651	6.9986	0.4589
7.5818	0.4721	7.5818	0.4656	7.5818	0.4594
8.1650	0.4727	8.1650	0.4663	8.1650	0.4602
8.7483	0.4735	8.7483	0.4670	8.7483	0.4610
9.3315	0.4743	9.3315	0.4678	9.3315	0.4619
9.9147	0.4753	9.9147	0.4689	9.9147	0.4630
10.4980	0.4767	10.4980	0.4703	10.4980	0.4644
11.0810	0.4778	11.0810	0.4714	11.0810	0.4656
11.6640	0.4796	11.6640	0.4732	11.6640	0.4675
12.2480	0.4812	12.2480	0.4748	12.2480	0.4691
12.8310	0.4836	12.8310	0.4772	12.8310	0.4716
13.4140	0.4857	13.4140	0.4793	13.4140	0.4737
13.9970	0.4890	13.9970	0.4826	13.9970	0.4771
14.5800	0.4916	14.5800	0.4851	14.5800	0.4796
15.1640	0.4969	15.1640	0.4904	15.1640	0.4850
15.7470	0.4989	15.7470	0.4923	15.7470	0.4870
16.3300	0.5123	16.3300	0.5056	16.3300	0.5003
16.9130	0.5066	16.9130	0.5000	16.9130	0.4948
17.4970	0.5580	17.4970	0.5508	17.4970	0.5453
18.0800	0.5043	18.0800	0.4978	18.0800	0.4929
18.6630	0.6662	18.6630	0.6578	18.6630	0.6516